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ABSTRACT

This proceedings presents the papers from a workshop on engineering writing and professional communications. The purpose of the workshop was to share resources and ideas for improving the teaching of professional communications within engineering colleges. The papers are: (1) "Engineering the Written Word" (keynote address) (Craig A. Rogers); (2) "Instructional Inquiry in the Workshop on Writing Centers in Engineering (a system for collaborating)" (Nancy Thompson); (3) "Collaboration between Engineering Faculty and an English Department Writing Center" (Audeen Fentiman and Paul Miller); (4) "Integrating Writing and Speaking throughout the Engineering Student's Curriculum" (Rob Friedman); (5) "Integration of English and Engineering in a Freshman Engineering Course" (Dave Bryenton); (6) "Student Advocacy through the Professional Communications Center" (Robert O. Pettus); (7) "Building Student Confidence through the Writing Center" (Deanna Ramey); (8) "An Engineering Student's Role in the Writing Center" (Stephanie Metts); (9) "History and Current State of Writing Centers" (Jennie Ariail); (10) "Research and Development of Professional Communications Centers: Today and Tomorrow" (Libby Alford); (11) "Research for Writing Center Development" (Kris Walker); (12) "Engineering Writing and Professional Communication: If We Didn't Have a Writing Center Already, We'd Have To Invent One" (Charles Brice); (13) "Assessment and TA Training" (Tom Smith); and (14) "Responding to Student Lab Reports: A Guide for Tutors" (Jean Gallagher). Breakout sessions focused on integrating professional communications into the Engineering program, establishing professional communications centers, and teaching assistant training. An "Epilogue" considers future collaboration. (SLD)

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Workshop on Engineering Writing and Professional Communications Centers

PROCEEDINGS

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ENGINEERING WRITING AND PROFESSIONAL COMMUNICATIONS CENTERS

Proceedings of a Workshop at the University of South Carolina
Department of Electrical and Computer Engineering
June 23-25, 1997

Funded by the Gateway Coalition of Engineering Colleges

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PREFACE

This Proceedings contains papers, summaries of breakout group discussions, and group presentations from a Gateway Workshop on Engineering Writing and Professional Communications Centers, Columbia, SC, June 23-15, 1997. We present them with appreciation to all the participants for the time and thought they contributed to make the Workshop successful.

We especially wish to thank the individuals and institutions that made the Workshop possible. First, to Edward W. Ernst, Allied Signal Professor of Engineering, we express our gratitude for his vision of a collaborative workshop on professional communications in engineering. Professor Ernst has long been a proponent of integrated curricula in engineering, and his support was indispensable in making this Workshop a reality.

We wish to thank Robert O. Pettus, Chair, and Jerry L. Hudgins, Associate Chair, ECE Department, not only for their support of the ECE Writing Center Program, but also and most especially for their guidance and input into planning Center activities. The ECE faculty, too, have generously contributed time and expertise to encourage the Writing Center's growth and acceptance. The Writing Center Program has succeeded because of these individuals' genuine commitment to student advocacy, active learning, and continuous quality improvement.

To Dean Craig Rogers, we offer our special thanks for his keynote address that demonstrated his personal commitment, and the commitment of the College of Engineering, to providing opportunities for students to excel in written and oral communications.

To the staff of ECE and the Gateway Project, especially Theresa Masters, Kathey Lorick, and Sheryl Hudgins, we want to say "Thank you" many times for countless ways you helped in planning, organizing, and troubleshooting the details of the meeting. Likewise, we are indebted to David London and the entire ECE Computer Support staff. The expertise and indefatigable spirit of the staff made the meeting run smoothly.

Finally, our deepest appreciation to the Gateway Coalition of Engineering Colleges for supporting both the 1996 and 1997 Workshops on Engineering Writing and Professional Communications Centers. It is gratifying to be a part of an organization that promotes and encourages collaboration to achieve the goals of engineering education and to make continuing improvement possible. And to our Gateway PAL (Program Area Leader) Professor Audeen Fentiman of Ohio State University, we offer our heartfelt thanks for advising and guiding us in program development.

The ECE Writing Center Staff

INTRODUCTION

On June 23-25, 1995, engineering faculty and writing specialists from a variety of institutions met in Columbia, SC, to talk and write together as they planned writing and professional communications programs for their institutions. The setting was a Workshop on Engineering Writing and Professional Communications Centers sponsored by the Gateway Coalition and attended by representatives from Gateway schools, SUCCEED Coalition colleges, and other institutions involved in engineering or professional education. The purpose of the workshop was to share resources and ideas for improving the teaching of professional communications within engineering colleges.

Prior to the workshop, participants were invited to submit short papers for presentation and topics for discussion. At the opening session, participants shared their individual goals and their expectations of the workshop. As they introduced themselves and their reasons for attending, their responses were entered into the computer files of the workshop proceedings, projected onto a large screen by LCD projector, and minutes later, printed and distributed to the participants. Thus, the participants' interests, listed below, created the workshop's agenda:

David Rocheleau	teaching good communications skills in the freshman engineering experience
Deborah Bosley	clarifying characteristics of good technical writing in engineering disciplines
Charles Brice	working with writing center professionals in meeting accreditation requirements
Bernadette Longo	identifying successful models for integrating writing instruction into engineering
Audeen Fentiman	developing programs to enable and motivate engineering faculty to integrate writing into their courses
Terry Ward Tucker	motivating students to write
Charles Glagola	improving students' communication skills to meet industry expectations
Nadia Medina	funding writing centers, offering more writing instruction, and integrating writing and communication skills in every class
Alan Grier	starting a discipline-based writing center
Diane Carr	developing content for a new technical writing course for engineering technology students
Rob Friedman	starting a writing center and gaining administrative support for the program
Dave Bryenton	fostering team cooperation in writing assignments
Paul Miller	studying the organization of discipline specific writing centers in various institutions
Deran Hanesian	developing techniques for collaboration between English and Engineering so that students can get the best education
Jean Gallagher	training tutors and TAs in the writing process

During the workshop, participants attended plenary sessions on collaboration, student success, writing center research and development, training and assessment, and freshman programs. A major part of the time, however, the participants worked together in breakout groups, outlining and exploring topics they had chosen. In these working sessions, group members developed plans and materials that would benefit their own institutions and others. At the conclusion of the meeting, each of the three groups presented the results of their work to the larger group. The final session also included reports on individual colleges' activities to help students improve their professional communications skills.

The workshop demonstrates the high productivity of interdisciplinary writing groups, even those assembled for very short periods of time. Writers' workshops or writing conferences provide resources that motivate and enable writing: time, genuine purposes for writing, and interaction with other writers. At the Workshop on Engineering Writing and Professional Communications Centers, participants had access to these resources. And as they shared a time and space for collaboration, these educators shared their thoughts and energies in addressing one of the nation's major concerns: educating professionals in science and engineering to communicate information with clarity, style, and integrity. The papers and summaries that follow demonstrate their commitment to this goal.

We hope that this summary of the Workshop Proceedings will be useful to our colleagues in engineering education who share the authors' concerns for ensuring that engineering graduates can communicate well. We hope also that our readers will come to share our enthusiasm for writing and professional communications centers in engineering. These centers, through their emphasis on dialogue and collaborative learning, engage engineering students in communicating about engineering throughout their professional education. The experience of communicating to another person or a group of people—in writing or in speech—teaches emerging professionals to talk and write like engineers in the process of acquiring the knowledge and acumen of engineering.

The ECE Writing Center Staff
Editor: Tom Gasque Smith
Contributing Editors: Libby Alford
Kris Walker
Deanna Ramey
Kristen Bearden
Stephanie Metts

Engineering the Written Word

Craig A. Rogers, Dean
College of Engineering
University of South Carolina

Dean Craig Rogers, in his address to the Workshop on Engineering Writing and Professional Communications Centers, persuades us that as leaders of the future, engineers must be articulate, thoughtful, liberally educated, and well skilled in communications. Perhaps this responsibility is even greater for engineers, Rogers says, because it is engineers who will be responsible for educating society about technology, who will warn us of its dangers, and who will create the knowledge structures for our future economic strength. The future success of engineering education and the engineering profession, Rogers notes, rests on embracing liberal education. For the profession to become a full member in the intellectual community and to become a leader, engineering graduates must become well read, well spoken, and masters of the art and skill of persuasion through the written and spoken word.

I am indeed honored to have this opportunity to welcome you to the University of South Carolina, and to share with you my thoughts on communication skills development within the engineering curriculum. I must admit, however, to being somewhat intimated by this audience. I feel a bit like a common layperson addressing the Archbishop of Canterbury on the importance of the church. But as Socrates said, "the unconsidered life is not worth living." Therefore, I stand here before you - the professionals - with a tremendous sense of humility, to consider the movement that has engulfed engineering education – the development of communication skills as an elementary element in the education of engineers. I will ask for each of you to forgive me from the start if I begin to preach, for I realize that I will be preaching to the choir. And rest assured that I realize that those assembled here are the custodians of a new approach of learning to write and communicate within the engineering college experience. Your presence here today is an indication of your leadership and dedication to this cause. And I personally thank you for your efforts – the engineers as well as the writers and English professors. And to the Engineering professors – please pardon my less than complimentary generalizations.

We are all here today because we all have a shared vision. The engineers of the future - the stewards of technology, and the technological leaders of the next generation - must possess the communication skills to be effective leaders, to convey complex ideas, theories, and

instructions to colleagues and the public, and in general to be whole in the pursuit of the engineers' rightful place among the intellects of society.

But where are we as a profession today? Are we considered the intellects of society as we were during the "Golden Age of Engineering?" No. How can we be when the public perception of us is "engineers can't write" which is not far removed the public perception that "football players can't read." How can we be when students entering engineering often claim that they chose Engineering as a profession because they don't like English class and – they can't write.

During the next several minutes I will share with you my thoughts on the history and future of engineering and will illustrate how essential the engineer's role will be to lead society, and the need to become an intellectual leader. I will also give you my personal opinion on technical writing – a minority view to be sure. And I will share with you the engineering grace and elegance I find in one of the most well-known works of oration – an example of technical writing in its most refined state.

Samuel Florman, in his book *The Existential Pleasures of Engineering,* describes the "Golden Age of Engineering" and shares some of its history. In May of 1902, the fifty-year-old American Society of Civil Engineers held its annual conference in Washington D.C. Robert Moore, the newly elected president, gave a welcoming address entitled, "The Engineer of the Twentieth Century." He began by eulogizing the engineers of the past for making human life "not only longer, but richer and better worth living." Then he acclaimed the achievements of his contemporaries and fellow members. Finally, he warmed to his chosen topic, the engineer of the coming era. Moore said:

> And in the future, even more than in the present, will the secrets of power be in his keeping, and more and more will he be a leader and benefactor of men. That his place in the esteem of his fellows - and of the world - will keep pace with his growing capacity and widening achievement is as certain as that effect will follow cause.

What a flush of pleasure they must have felt, those engineers of 1902, to hear themselves described as *benefactors of mankind*. What a quickening of the pulse there must have been as they listened to their leader predict success and glory for them in the years ahead. Doubtless, they sat quietly, looking solemn in their starched collars and frock coats the way we see them in faded photographs. But beneath those sedate facades they could not have helped but feel the stirrings of enormous joy.

To be an engineer in 1902, or anytime between 1850 and 1950, was to be a participant in a great adventure, a leader in a great crusade. Technology, as everyone could see, was making miraculous advances, and, as a natural consequence, the prospects for mankind were becoming increasingly bright.

Every few months, it seemed, some new technological marvel was unveiled and greeted with public enthusiasm. The completion of sizable technological undertakings was marked with celebrations fitting for an armistice or a coronation.

There were a few voices raised in alarm against the coming of the new machines and deploring the worship of material progress. Thoreau is perhaps the most notable, but many of the writers who most admired technology – such as Whitman and H.G. Wells – also feared it greatly. The conventional wisdom was that technological progress brought with it real progress – good progress – for all of humanity and that men responsible for this progress had reason to consider themselves heroes.

There were a number of reasons for the excitement and hope associated with the progress of technology. In the earliest days of our nation, both Jefferson and Hamilton commented on how the engineer's works would also contribute to brotherhood by literally bringing men closer together and that this would be accomplished by the designers and builders of roads and canals. Through the years, each advance in transportation and communication evoked new commentary on the theme. Walt Whitman rhapsodized:

> Lo, soul, seest thou not God's purpose first?
> The earth to be spann'd, connected by network,
> The races, neighbors, to marry and be given in marriage,
> The oceans to be cross'd, the distant near,
> The lands to be welded together.

I think he was referring to the Internet.

As the Panama Canal neared completion, poet Percey MacKaye exulted over this wondrous work:

> Where the tribes of man are led toward peace
> By the prophet-engineer.

But what happened? We could discuss this question for days but suffice it to say that engineering education started down a path where we lost the intellectual grounding necessary to be considered the intellects of society, to be the good-stewards of our society, to be leaders. Engineers not only distanced themselves from the liberal education foundation of the leaders of society but also aggressively shunned those with such affinity. Simply examine the engineering curricula across this nation – count the number of free electives allowed (or shall we say possible), the restrictions placed on humanities courses, and ask the engineering graduates what books they read while students at their universities. So today, we find our profession at the proverbial crossroads – we have decisions to make about the appropriate mechanisms to educate the practitioners of a field devoted to the creation of knowledge.

Therefore, it is my personal view, not one shared by all, that the future success of engineering education and the engineering profession rests on embracing liberal education. It rests on educating the engineers of the future how to be stewards of the good for all mankind. And it rests on developing the leaders of our society. And you, all of you, are needed to take us there. The leaders of the future, as in the past, must be articulate, thoughtful, liberally educated, and well skilled in the art of communication. Engineers must be so - and even more so than most. For it is engineers who will be responsible for educating our society on technology for the future, who will warn of us the dangers of our technological wanderings,

and who will create the knowledge which will be the foundation for our economic strength in future generations.

With this said, let me also propose that engineering or technology education is needed throughout this nation to truly fulfill a liberal education and its mission.

But now, I shall venture into the unpopular - and perhaps even the sacred - for this group assembled. I contend that engineering education has done great harm to itself by defining a discipline, unto its own, which I believe has, or at least had, reduced the intellectual level of instruction and practice. The discipline is - technical writing.

For the past several decades, technical writing has been taught in engineering curricula – generally by engineering professors who were no more a model for good writing than they were adequate to teach the poetry of Robert Frost. Technical writing has two basic rules – be concise, and be technical. The typical mode of instruction was similar to teaching engineering graphics – follow the template given and do not deviate. Write in the passive voice. Write in the third person. Do not use color. And for heaven's sake, do not add style. If the reader did not see an image of the author as a pocket protector wielding, near-sighted, Mr. Magoo – or perhaps Dilbert, then the author had strayed from the *discipline* of technical writing.

So let me be concise.
Please ask our students to write in the first person.
Please ask our students to write in the active voice.
Please encourage our students to write with style and when appropriate - even with flair and a flourish.

I appreciate concise writing – I really do. But I believe that the "business of writing and oration" is similar to the "business of engineering." There are three elements that the engineer must consider in the design of commercial products: 1) performance, 2) cost, and 3) aesthetic. One may like the performance of a Mercedes convertible, and love the looks, but at $65,000 think the Neon is a pretty good compromise. The engineer must always consider the compromises the public will make with these three metrics of commercial goods. Likewise, in writing, the performance is related to content – the message. The cost is the length of time the author or speaker is asking the reader or listener to devote to the task – and the aesthetics represents the style. Even in technical writing, these three elements reign. We teach students to write one page letters to executives because - that is all the time they can afford (get it? cost vs. content vs. style)...we teach students the fundamental elements of engineering design...even when we teach writing.

James Kilpatrick claims, "There is more to communication than merely effective conveyance of an idea or image." Let me convey an image: After a rainy and windy night, the sun came up. The sentence is effective; it is good enough for ordinary purposes. But this is Wordsworth:

> There was a roaring in the wind all night;
> The rain came heavily and fell in floods;
> But now the sun is raising, calm and bright.

We value good writing, and it comes in many grades of quality. But the writing of engineers need not be poor, need not be sterile, and need not be uninspired. I do not expect to find the instruction manual for my VCR to read like Wordsworth, and certainly not like Faulkner, but I do expect good writing – technical or otherwise.

The tools we wish to stimulate, share, and sharpen with our students are good communication skills, the skills necessary to *persuade*. Technical writing is nothing more than learning how to communicate - with a particular audience - for a particular purpose. However, if the author does not have the tools to be a good writer, in general terms, it is unlikely that the author will be able to master a subset of the craft such as "technical writing." After all, do we expect to teach someone how to compose great jazz if they have never heard great jazz? Do we expect to teach someone to compose great jazz if they do not know the fundamentals of composing music?

The difficulty we have as professors in teaching good technical writing is the lack of good examples. Where are we to find them? In technical journals? I think not. In technical proposals? Not likely. The teaching method of the past has been the proverbial blind leading the blind.

I contend that a great writer with good technical skills will be a great technical writer. A great engineer with marginal writing skills will never become a good technical writer until she or he learns how to write.

I have heard some claim that to learn how to write that you must simply write a million words. That suggests that to learn how to play golf you simply need to hit a million golf balls – I submit to you that without instruction you will simply learn how to play golf badly and will be very tired when you are done. However, reading a million pages of great prose of various styles, with different purposes, intended for different audiences, would be a grand place to begin the teaching, and learning, of a classical craft almost as old as engineering.

Great writing is the result of the same process of design as great engineering innovations. It begins with inspiration and then the refinement of ideas, examining numerous possible paths to the solution or final goal, and the process of optimization or as they may say in culinary school, "simply stirring the sauce to make the reduction." Good writing and oration are products of a logical process. The process of good writing, if presented to engineering students well, should resonate with the spirit of the creators and inventors that they are. They should admire the use of the deductive arguments that lead to inductive exhortations—and the insertion of heuristic arguments to stir emotion. The logic, the design, the mechanisms created to effect change…the beauty of engineering, the beauty of ***engineering the written word***.

As I said before, it is difficult to find examples of great technical writing. I personally enjoy the work of Prof. Henry Petroski. But please indulge me as I share with you a well-known oration, one which I believe can capture the spirit of engineers and engineering students. A piece perhaps most well known for its conciseness – not to mention the message.

THE GETTYSBURG ADDRESS (1862)

Four score and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

But, in a larger sense, we cannot dedicate—we cannot consecrate—we cannot hallow—this ground. The brave men, living and dead, who struggled here, have consecrated it far above our poor power to add or detract. The world will little note nor long remember what we say here, but it can never forget what they did here. It is for us, the living, rather to be dedicated here to the unfinished work that they who fought on this field have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us—that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion; that we here highly resolve that these dead shall not have died in vain; that this nation, under God, shall have a new birth of freedom; and that government of the people, by the people, for the people, shall not perish from the earth.

Now that is a great piece of engineering. What an elegant solution! That is a piece of work that all good engineers can appreciate. I shall now be so bold as to try to explain, to this audience of professional writers, the beauty of the design of this construction of prose from an engineering point of view. I will paraphrase some of the statements to illustrate simply the beauty of the engineering design of a speech I firmly believe to be one of the best pieces of technical writing ever recorded. And I appreciate your indulgence as I, an engineering professor, describe the logic and design of one of the greatest works in American oration.

We begin with the objective and purpose of President Lincoln's design...what was Lincoln's objective? Was it to dedicate a cemetery? No. His objective was clear—it was to revive the spirit of the living. The dedication served as nothing more than an excuse.

> *Eighty-seven years ago our fathers established on this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal.*

Lincoln begins his speech by providing a foundation or grounding by referring to well-known words of Jefferson and the basic tenets of our nation's birth. All in the crowd can relate and resonate with this opening.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure.

He now refers to the war…a large and immense image.

We meet on a great battlefield of that war.

He now focuses on the battlefield…a large field where thousands have died.

We have come to dedicate a portion of that field as a final resting place for those who here gave their lives that this nation might live.

And now, to a smaller part of that field. He has focused our attention, captured our emotion and amplified it (perhaps we can develop a new law of nature – the conservation of emotion). He has prepared the case…he has deductively focused the mind in tightening spirals, moving from the great civil war to a great battlefield of that war, then to a portion of that field – progressively reducing his target, from the abstract to the concrete. He has taken us from what the mind can apprehend at best by symbolization to what the hands and heart can feel – not far removed from the task of most technical writing.

It is wholly fitting and proper that we should do this.

And then, the finale of his deductive argument, the rhetorical flourish…the crown molding, the statue in the courtyard, the decoration to create completeness.

Now to take that focus and move from the deductive to the inductive portion of his case. Lincoln begins:

In a larger sense, however, we cannot dedicate—we cannot consecrate—we cannot hallow—this ground.

Here, he includes "us," all of "us present."

The brave men, living and dead, who struggled here, have consecrated it far above our poor power to add or detract.

He now includes all of us, the living and the dead, the brave…and the crescendo has commenced.

The world won't long pay attention to, nor remember long, what we say in this place, but the world can never forget what they did in this place.

And now to the "cause"…we have moved from the "us" to the - "brave, living and the dead" to the "cause." Now the President is about to embark on a journey from the "unfinished work" to the "great task" to that "cause."

Rather it is for us, the living, to be dedicated here to the unfinished work that they who fought on this field have thus far so nobly advanced.

Rather it is for us to be here dedicated to the great task remaining ahead of us:

That from these honored dead we are inspired in greater devotion to that cause for which they gave the last full measure of devotion.

And "that cause" is:

That we here resolve absolutely that these dead shall not have died in vain;

That this nation, under God, shall have a new birth of freedom;

And that government of the people, by the people, for the people shall not vanish from the earth.

This is masterful. This is a representation of engineering of the highest order. The refinement, the optimization, the clarity and simplicity – the elegance is all that any engineer strives for in our material world. This is what technical writing should be. This is an example of the grace and elegance of ***the engineering of the written word.***

We can indeed capture the interest of engineering students. We can, should, and need to share with all engineering students that writing and communication skills are as fundamental to the profession as calculus. And we can even show how writing is more akin to engineering than math class. For we can teach ***the engineering of the written word.***

Reid Buckley, a neighbor of sorts in Camden, recently shared with me that the words of the speaker, even their broad sense, are likely forgot within the half hour; it is remembrance of the emotional experience of listening to him that lasts, in which a few shreds of the intellectual content – with luck – linger.

Therefore, I hope, aside from the words I have shared with all of you, that you will remember my passion for our profession, for my profession - engineering, and for our profession to become not only a full-member of the intellectual community but to become a leader. And my passion for our students to become well read, well spoken, and to become masters of the art and skill of persuasion through the written and spoken word. Please remember my passion, for if anything "lingers" let it be this, my passion for ***the engineering of the written word.***

Thank you for your attention. Thank you for your interest and help in making engineering a more intellectual profession and one that will contribute to leading our society, future generations, and its people to a better life. And welcome to the University of South Carolina.

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COLLABORATION

For engineers and writing center professionals, collaboration is a way of thinking and creating. Engineers carry out their projects in teams, knowing that teaming produces results superior to the collective work of individuals. Writing Center consultants employ collaborative methods to help writers achieve their communicative purposes, knowing that writers and speakers create meaning in dialogue and discourse with readers and listeners. The respect for collaboration that these two professional groups share provides a foundation for cooperating in conducting research and designing educational programs related to professional communications in engineering. The Workshop on Engineering Writing and Professional Communications Centers in 1997, and its forerunner in 1996, have provided opportunities to identify and develop cooperative ventures between Engineering and Composition and Rhetoric/Writing Center faculty.

A Plenary Session on Collaboration in the 1997 Workshop explored the nature of collaboration in research, particularly in interdisciplinary endeavors, by drawing on a method of inquiry used in writing groups. This method, **Interactional Inquiry**, focuses on the discourse of collaboration as a means of investigating phenomena and creating the knowledge needed to understand them. The opening paper in the session, by Thompson, explained the discourse principle involved: the production of knowledge through rounds of interaction and deliberation. Interactional Inquiry works to acknowledge, build, adapt, change and refine ideas through active and ongoing communication of group members. The workshop demonstrated the use of Interactional Inquiry by using it as the organizing principle and by calling participants' attention to the knowledge they were creating as they explored problems and solutions together.

The presentations in the Plenary Session on Collaboration also demonstrated the effectiveness of Interactional Inquiry in achieving long-term results. Two of the papers in this session discussed or built on ideas and inquiry begun at the first workshop which had been held in July 1996. The first, the collaborative paper by Fentiman, Miller, and Bausser, of The Ohio State University, describes a joint project between the Engineering faculty and the English Department Writing Center at that institution. Two of the authors participated in the 1996 workshop on Writing Centers in Engineering and began discussion of collaboration at that event. A second paper, Friedman's discussion of "Integrating Writing and Speaking throughout the Engineering Student's Curriculum," connects a presentation at the 1996 workshop with his further exploration of questions concerning interdisciplinary collaboration.

The final paper included in this collection of ideas on collaboration is an outline of a report presented by Bryenton, an associate professor at Burlington County College, which is an affiliate of NJIT. The joint participation of these affiliate schools in the workshop reflects the growing commitment to collaboration among engineering educators, as well as the innovation that results from their cooperative inquiry. And as all of the papers in this section attest, conversations that begin at a central place can move out to bring about change by sparking further rounds of inquiry, broader participation, stronger collaboration, and innovation.

Interactional-Inquiry in the Workshop on Writing Centers in Engineering (a system for collaborating)

Nancy Thompson
Department of English
University of South Carolina

In this paper from the opening Plenary Session of the Workshop on Engineering Writing and Professional Communications Centers, Professor Nancy Thompson discusses the concepts and philosophies of a system for collaborating, which she and a colleague have called "Interactional Inquiry." This system involves all participants in a group in conducting inquiry into topics chosen by the group. At the same time, it calls their attention to the role of group interactions in the creation of shared meanings. Interactional Inquiry was selected as a methodology for the workshop because it promotes genuine collaboration and produces results valued by the group. This method of inquiry is particularly appropriate for Coalitions because the participants, through sharing their ideas, identify goals together and create strategies for reaching those goals individually and collectively. As Thompson explains, the use of qualitative research methods such as Interactional-inquiry is no longer limited to basic research. Instead, the methods are also being used in continuing program development and review. Interactional Inquiry has proved an effective approach in creating and developing the Gateway Writing Improvement Project at ECE. The Workshop on Engineering Writing and Professional Communications Centers provides an opportunity to use the method to experience its effectiveness in achieving the goals of individuals from a number of dispersed institutions and different professional disciplines.

From our first meetings to plan this workshop, we looked forward to it as a time for collaboration with people from other campuses and other departments. As we announced on our Workshop Webpage,

> We are thinking about the Workshop as an instance of Interactional Inquiry, which is the use of qualitative research methodology for development of our

program. Interactional Inquiry—as the Workshop structure—provides a system that organizes the participants by involving them all in creating ideas. More generally, the Workshop is a collaborative inquiry group: a learning method in which a group forms a community to study an agreed-upon subject. Each group member takes a proactive role in learning about and contributing to the subject of the study. Though there will be a facilitator in charge to move the work along, all are responsible for contributing to the work, supporting each other, and helping each other develop ideas.

We refer to our particular type of cooperative inquiry as "Interactional Inquiry" in order to focus on the interactions that must occur for a cooperative inquiry group to develop and refine ideas. As ideas are expressed, discussion continues, ideas are refined. Further, when possible, recording of the discussion provides a product to come back to and to begin another round of interacting about the idea. Interactional Inquiry works to acknowledge, build, adapt, change, and refine ideas through active and ongoing communication of group members.

The workshop structure includes breakout sessions that occur after plenary sessions; these group meetings are the site at which the interaction occurs. . . . The groups' work will eventually be published as workshop proceedings.

Workshop Structure

Let me first give some background on the planning for the Workshop. In order to give ownership of the Workshop over to the participants, the Workshop structure was designed to include almost six and one-half hours of breakout sessions as work time during the first two days. Small groups were to produce an oral presentation for the last workshop session on the third day, as well as other written materials initiated by the groups. In the Workshop promotional materials, potential participants were asked to choose from a list of breakout group topics, which gave us the necessary information for assigning the participants to the breakout groups at the beginning of the Workshop. (These were the breakout group topics: Integrating Professional Communications into the Engineering Program; Establishing Professional Communications Centers; and a combination of two topics on Integrating Professional Communications into the Engineering Program and TA/Tutor Training.) In the promotional materials, we also asked Workshop participants to bring a short piece of informal writing to contribute to the Interactional Inquiry in the breakout groups (with paper and disk copies if possible). As a contingency plan in case participants were unable to bring pieces of writing they were working on, we anticipated ways in which the breakout sessions could organize discussions of group members' decisions about what project they wanted to work on for their oral presentations and written materials. If necessary, Workshop leaders were prepared to build the breakout sessions on responses to plenary sessions or exercises we had ready if needed.

The purpose of organizing the work around the series of breakout sessions was to provide the participants with a space in the workshop to become productive members of the Interactional Inquiry; this organization would allow them to guide the study in directions of value to them. Our own learning about writing in engineering and teaching TAs is an ongoing Interactional Inquiry since the inception of the Writing Center Program in 1995. We conceived the 1997

Workshop (following the first one in Summer 1996) as an extension of the Interactional Inquiry to others who would join us as Workshop participants. From the beginning of the planning, we saw our planning group as the initiator of the Interactional Inquiry. We began by meeting for general discussions several months in advance to create the design of the program. Then, in the more intensive month-long preparation period, we practiced Interactional Inquiry by keeping records of ideas that came out of meetings, bringing them back to the group in writing as a way to keep them in our attention to refine them. Through the winnowing process, then, the final plans went on large sheets of paper attached to the walls in our planning room so tasks were immediately visible to the whole group. The document produced by the planning group that set up the Interactional Inquiry for the participants, then, was the Workshop Program.

The first session of the Workshop included introductions by each of the participants, with a statement of their interests. These statements were recorded in the process on a computer, projected for all participants to see, and then printed out as baseline information for the first breakout session, as a place for the groups to begin their work. We also used this document to illustrate the process of Interactional Inquiry: how recording the work produces a document for subsequent group interaction. It also becomes part of these proceedings.

A Short History of Interactional Inquiry

Our concept of Interactional Inquiry has emerged from the changing research methodologies in Composition and Rhetoric. Until the early 1970s, the major research method we used for studying development of writing abilities was experimental research, which is fraught with problems in the study of human behaviors because variables and causes are seldom clear cut. About that time, researchers in composition began adapting qualitative research methods from the social sciences, such as ethnography, which focuses on thick description of cultural and educational phenomena rather than quantification of data from the operation of specific identifiable variables. In the recent history of research methodologies in composition, ethnography has exploded out into a myriad of qualitative research methodologies, some of which can be used to generate quantified data as well.

Multiple Research Methods

Ethnography contributed observation techniques in the classroom and in other educational situations. Interviews, and recordings of them, capture ideas and explorations of the people important in our studies. Conversation analysis uses video recordings to stop the fast-moving flow of talk so we can study interactions between people. Text analysis, including genre analysis and other discourse analysis techniques, gives us means of looking closely at the texts students produce and those they study. The study of the processes of thinking and writing are further opened out for study by protocol analysis, which asks the writer/thinker to say aloud what thoughts are going though the mind while writing or thinking. Though these methods produce qualitative data, coding of the data in specific categories can result in quantification, thus integrating the two research paradigms.

Basic Research, Evaluation, and Assessment

All of these methods have come to take their place beside experimental research. All have been developed as methods for basic research, in the pursuit of knowledge for the sake of knowledge. However, qualitative methods are now being applied as a means for evaluating and assessing the programs we develop. Instead of using only a quantitative study of countable instances of particular variables, qualitative data such as interviews search more deeply for reasons behind countable instances. Protocols let us see into the messy thinking processes of creators. Genre studies look carefully and analytically at the qualities of documents written in different fields and for different purposes. And ethnography applied to the classroom and the workplace focuses a virtual microscope on these different cultures and how people learn and interact in those cultures. In all of these ways, we can gather information for summative evaluation of programs or use it more formatively in feeding back in to improve the program.

Program Development

In another generation of qualitative methods, though, application is no longer restricted either to basic research or to evaluation/assessment of programs. In addition, these methodologies are applied in the ongoing development of programs and ideas. Generally called cooperative inquiry, the methodology works to organize groups of people so they can pursue their interests in a systematic way for creating knowledge to answer questions the group poses for itself. In the emerging development of our Writing Center Program in Electrical and Computer Engineering, we see ourselves as a cooperative inquiry group pursuing a continuing development of ideas and improvement of our program. We have given a name to our kind of cooperative inquiry, calling it Interactional Inquiry, as a way of focusing on the important interactions between the people in the environment, as well as between the people and any other relevant elements of the environment, such as texts, materials, technology, etc. The name works to make us continually aware of how we interact with each other and our environment to produce knowledge.

Research in Development of the ECE Writing Center Program

In the ECE environment, our Interactional Inquiry is the umbrella for the use of several other specific methodologies. First, Libby Alford came into the environment as an ethnographer, studying the culture of engineers in order to see how a writing and professional communications center could be integrated harmoniously into the engineering environment, using strengths from her field of composition and rhetoric. She has called it "research by walking around."

Kris Walker's contribution to the research is a dissertation studying the genre of engineering lab reports. An outcome of her research is that it informs writing center consultants and group leaders about the requirements of the lab report and how to teach these requirements to inexperienced student engineer-writers. Her research is a form of Interactional Inquiry in her dialogues with engineering experts to gather information on "What is a lab report?" We hope

that her research can apply generally to others who want to begin figuring out what kind of writing is required in different fields.

Other research projects on the ECE Writing Center Program include reflective teaching practice studies conducted as masters theses by Debra Dyck and Chris Fosen, documenting their experience as teachers of writing in ECE lab courses. Deanna Ramey has reported at conferences her case studies of students who were helped by writing consultants. Tom Smith is involved in reflective analysis on the consultants' writing of progress reports to engineering instructors. From this analysis he is looking at the effect of the environment on writing instructors and at the maturation process of writing consultants.

As we further develop our Writing Center Program, we will apply qualitative methodologies for assessment of student writing and assessment of our other activities in the engineering environment. Further, we plan to continue using protocols to help the engineering TAs and faculty to articulate their tacit knowledge about the work they do. For instance, as we learn to use a computer program called CommonSpace for commenting on students' writing, we plan to ask engineering TA instructor Willie Bates to talk aloud about his concerns on giving students feedback on their writing.

Summary

Interactional Inquiry is a system for collaborating that we see as an umbrella for organizing the ongoing researches that different members of our team bring to the metaphorical table for reflection. And thus, through interaction, we affect each other and the Program as a whole through our research studies. Ours is a collaborative/team approach, appropriate to the team orientation of engineering education, using various research methodologies for ongoing program evaluation and development. Further, the concept of Interactional Inquiry guided the structuring of the Workshop, forming the Workshop itself as a round of research and opening up the structure to include all the participants with their contributing points of view. This printed proceedings, recording formal papers/presentations as well as the more informal materials produced in the breakout sessions, continues the research by providing a document to become the reflective basis for continuing study of "Engineering Writing and Professional Communications Centers."

Collaboration Between Engineering Faculty and An English Department Writing Center

Audeen W. Fentiman, Civil and Environmental Engineering
Paul B. Miller, English
Jaye Bausser, English
The Ohio State University

At The Ohio State University, an engineering faculty member and staff of the English Department's Writing Center developed a collaborative project that demonstrates the effective use of Interactional Inquiry in achieving instructional goals. Rather than using the more traditional team teaching approach to achieve WAC goals in an engineering class, the engineering faculty asked the Writing Center professionals to consult on writing instruction and student writing in an engineering design course. The Writing Center representatives and the Engineering faculty explored together the professor's writing assignments, in-class explanations, and comments on drafts. The Writing Center staff also interviewed students to learn what types of comments were most effective and helpful. The collaboration between the Engineering and Writing professionals gave both groups more insight into effective ways to present writing assignments and comment on student writing in the Engineering environment. It also resulted in development of new materials to guide students writing reports in future sections of the design course.

Introduction

At The Ohio State University (OSU), students in a beginning engineering course are required to prepare a formal written report and give an oral presentation on a team design project. During the past year, engineering faculty and staff from the Writing Center, located in the English Department, have collaborated to improve the written reports submitted by the engineering students. This paper describes the writing assignment, discusses the nature of the Engineering-English collaboration, and presents preliminary results of that collaboration.

Engineering Course and Writing Assignment

The course in which the writing assignment is made is Engineering Graphics 166 (EG166), a course required for all engineering students at OSU. On average, about 10 sections of the course are taught each quarter, providing ample opportunity to test new teaching materials and techniques, make modifications, and test them again within a single academic year. Historically, the goals of the course have been to help the students develop their visualization and graphical communications skills and to teach them to prepare and read working drawings. In the early 1990s, a team design project was incorporated into EG166 to help students understand the design process and develop teamwork and written and oral communications skills.

Each design team is required to prepare a formal technical report and make an oral presentation. This paper focuses on the written report.

Students are asked to prepare a report very similar to one that would be produced if they were working in industry and had been hired to design a new product for the mass market. The audience for their report is the person (or company) that paid for the design and plans to manufacture the product. This is a difficult concept for some students. They are accustomed to being asked to write a certain number of pages which a composition teacher must then read and critique. Many engineering students dread giving the paper to that teacher and would be just as happy if the teacher didn't read it. But with a design report, the writers' goal is for the sponsor to read the report, understand it, be convinced that the work described is good, and, hopefully, hire the project team for future work. The writers must imagine themselves in the readers' place and provide information that the readers need - in a format that will allow the readers to find specific pieces of information easily. In this writing assignment, students are no longer writing because someone said they had to but because they have something to say that they want the reader to understand.

Since technical writing and the format of a technical report are unfamiliar to virtually all beginning engineering students, a detailed outline of the report is provided along with a description of the goals of each section. An abbreviated outline of the report is shown below.

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C. Refinement of the final design

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B. Working drawings - drawings from which a prototype could be built

Students are expected to integrate the text and graphics such as sketches of the preliminary concepts, graphs of data collected for use in refining the final design, and working drawings of the final design.

Students work on the design project during the last six weeks of the academic term. The project is done in addition to other course work. At the end of the second week of the project, students submit a draft of the first three chapters of the report. The instructor comments on the draft and returns it to the students in week three. In week four, students submit a draft of the final two chapters of the report. Comments on that draft are returned to the students in week five, and the final report is due at the end of the sixth week.

Collaboration Between Engineering and the English Department's Writing Center

The engineering faculty member and the Writing Center staff had well-defined and distinct reasons for wanting to collaborate. The engineering faculty member wanted Writing Center personnel to observe and comment on the presentation of the writing assignment. In addition, she asked Writing Center personnel to read and provide feedback on comments she made on the students' writing. Her goal was to find the most efficient way to help the students understand the assignment and produce a high quality report. It was important that the final report be of good quality. Since most students will never see the comments on the report submitted at the end of the quarter, if that report was a poor one, the students would only have learned how to prepare a poor report. It was equally important that the time devoted to writing instruction be minimized since the design project is a relatively small portion of the work students are expected to complete during the last six weeks of EG166.

The Writing Center pursued collaboration with engineering faculty in an attempt to improve its Writing-Across-the-Curriculum (WAC) services. In the past, those services had largely assumed that there were generic writing conventions that could be applied to any discipline, an assumption which was at least partly responsible for the predominately passive stance of the program, because it implied that it was not necessary for Writing Center staff to work with teachers of writing in various disciplines to determine where, when, why, and how they used writing. Consequently, general handouts were produced to help teachers integrate

writing into courses, consultations were given when instructors pursued them, and occasional presentations were given to classes when instructors requested them.

The combination of dissatisfaction with the vitality of the program and a widespread shift to more discipline-specific research in the field of composition led to a decision to take a more proactive approach. Chairs of departments were queried for names of faculty who would be interested in discussing the teaching of writing within their discipline. These discussions provided not only useful information, but continuing contacts such as that made with the EG166 professor who participated in the collaborative project described in this paper.

Gathering Information about Student Writing

Data was collected in four ways:

1. **Observation of classes.** Classes were observed when the professor commented on writing—such as when the paper was introduced or when drafts were returned.
2. **Review of drafts and final reports.** Both the professor's comments and students' revision based on those comments were analyzed.
3. **Student interviews.** Students were interviewed to obtain their views on all aspects of the writing assignment.
4. **Discussions with professor.** The professor was regularly consulted about the assignment and methods of instruction.

Preliminary Observations—Presenting Report Conventions

Our preliminary observations will contrast the design report with writing as it is typically taught in first-year composition classes. This focus is motivated by an interest in understanding how student writers must shift from the conventions typically taught in composition classes in high school and early college to the conventions of technical writing required by engineering.

- **Shift in Audience.** For many students the design report may be the first time they have been required to write in a genre determined rather strictly by an external "real" audience rather than in a genre heavily influenced by a teacher's individual preferences and requirements. Many genres that students typically write in—especially those which emphasize personal voice—allow fairly wide variations within general conventions. The design report, however, has more prescriptive conventions and allows the writer less latitude for improvisation.

- **Report as Reference Tool.** A salient result of the shift in audience in the design report is that readers will not read the report linearly from cover to cover, but will instead refer to sections of the report that are pertinent to their interests. Accommodating non-linear reading is a novel task for student writers; when they have written objective papers that require them to go beyond their personal experience it is normally in the form of a research paper, which is still highly linear in form and fairly fluid in convention.

  There are several consequences to such non-linear reading of the report. First, there is a need for overt visual guideposts such as tables of contents, headings, subheadings, lists of

figures, and the like. Student writers are, however, more accustomed to giving semantic, transitional phrases for such guideposts: few have had experience giving the sort of visual cues required by the design report. They are thus unaware of the need for strict consistency in visual format required to facilitate ease of navigation through the report. Similarly, they do not understand the need for sections of the report to be semantically self-contained so that a reader can understand parts of the report if they are read in isolation. The repetition required for self-contained sections would be viewed as useless redundancy by most of their previous writing instructors.

- **Voice.** There is in engineering writing, of course, the requisite formal tone with its attendant displacement of personal voice and personal experience. But the shift in voice involves additional complications for the writer. In composition courses students are typically encouraged to develop lengthy, complex sentences; in engineering writing there seems to be a predilection for fewer complex sentences, as well as a preference for the objective over the clever.

- **Integration of Visuals.** The professor often pointed out that the design report should satisfy three types of readers: the reader who wished to consult only graphics; the reader who wished to consult only the written text; and the reader who wished to use both integrally. Satisfying all these readers is a difficult and radical shift for students. They may have satisfied the text reader in English class and the visual reader in math class, but few have likely been asked to satisfy all the above readers, in the same context, simultaneously.

Preliminary Observations—Responding to Student Writing

Design reports (drafts and final reports) from three-quarters of the same course and same teacher were analyzed. This gave a general sense of the types of comments and how they were or were not used. A close examination of five reports was made to track precisely the effects of comments on student revision. Comments on the final reports were compared to the drafts to determine whether the problem noted in the final paper had been present in the draft, and if so, whether or not it had been noted by the teacher and responded to by the writer. Comments were divided into categories ranging from broad questions and facilitative comments to directive comments and direct editing.

Though a wide variety of comments was employed, directive comments and direct editing were most prevalent. The importance of format and visual consistency made directive comments necessary, and the comments were generally efficacious in that students used them successfully to revise their papers. However, students tended to follow the directive comments slavishly and neglect to make further revisions on other parts of the paper that reflected identical or similar error patterns to those that were marked. Those students who did apply the comments more globally tended to produce more professional looking reports that met the proper conventions for style and format.

Considering the results of the analysis from a theoretical and pedagogical perspective, it is clear that the commenting style must match the goals of the assignment. This is contrary to current composition theory which favors, universally, a facilitative commenting style. What is also clear, however, is the fact that one comment doesn't fit all needs. As the design report

shows, although the majority of comments need to be those which model through editing, other types of comments are also needed and effective. Questions and other facilitative comments were effective means of prompting students to think through and revise some problematic sections, though when students didn't understand the comment it was typically ignored during revision. The difficulty with such comments is understanding the extent to which a student will recognize the problem and have sufficient writing skills to correct it. It is more difficult to assess the effect of praise, although research in non-technical writing has shown that it is highly effective and under-utilized. Aside from the obvious benefits for the morale of the students, praise contributes to more extensive use and wider application of writers' strengths.

Products of the Collaboration and Their Uses

The Engineering-English collaboration resulted in two products: (1) reports on the effectiveness of the writing assignment presentation and of the instructor's comments on draft design reports and (2) a handbook to be provided to students as a guide for writing the design project report. The reports summarize the students' comments on how effective presentations on the writing assignment were and present the Writing Center Staff's analysis of the comments made on the students' papers, including the types of comments made, the students' perceptions of those comments, and the extent to which the comments were incorporated into the final report. These reports will be of use to each person teaching an EG166 course at OSU or similar course at another institution.

Current plans call for the handbook to be included in the workbook purchased by all EG166 students. As a result, the same guidance for preparing a design project report will be available to all EG166 students, regardless of whether their instructor is formally collaborating with the English Department's Writing Center.

Integrating Writing and Speaking throughout the Engineering Student's Curriculum

Rob Friedman
Department of English
New Jersey Institute of Technology

Rob Friedman, a participant at the 1996 workshop, discusses a critical question he addressed in considering collaborative approaches discussed at that first meeting. Here, in his 1997 presentation, Friedman reflects on the meaning of interdisciplinarity, especially as it applies to writing and language instruction for engineering students in the Freshman Year. Friedman asks: Should we continue to work toward establishing and achieving goals for student writing in interdisciplinary projects, such as paired engineering and composition courses in the Freshman Year? If the two disciplines have different definitions of good writing, can they agree on common goals for collaborative writing programs, strategies for reaching them, and ways to respond to student writing in interdisciplinary projects? Rob answers affirmatively, but realistically, and provides some provocative suggestions for developing true collaboration. His thoughtful exploration of collaboration alerts us to the challenges of interdisciplinary inquiry and program development.

Genre, Interdisciplinarity, and the Freshman Year

Those of you who attended last year's workshop undoubtedly remember Mya Poe and her discussion of genre -- how writing for the lab is different from writing for the composition classroom -- and how that affects the work and the role of writing centers, disciplines and members of departments. Mya's presentation, for me, was very provocative because it highlighted a dichotomy that is hard to reconcile: the often divergent roles and definitions of writing that exist between engineering and humanities faculty.

When I left USC last summer, one question stayed with me: Given the cogency of Ms. Poe's argument and the success of SC's genre-specific writing center, should we continue to struggle toward writing goals in interdisciplinary projects such as NJIT's pairing of Fundamentals of Engineering and First Year Composition? In fact, why break down disciplinary walls if the students' writing efforts, when put to the singular tests of specific

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disciplines, as they usually are, can easily come up short because of differences in what each discipline values?

Paired in Name Only

Independent Syllabi, Independent Goals
Disillusioned Students, Frustrated Faculty

The question remains salient at NJIT for two basic reasons. First, we continue to talk about the importance of writing in engineering courses and have touted the freshman year as the opportunity to act in concert, but the coordination between engineering and writing faculty at the beginning of the semester is not very effective, each side holding onto their subject matter in the form of distinct course requirements. And this is inevitable, I think, even right in a way, when there's disciplinary material to cover, disciplinary mandates to fulfill, all resting on an institutional foundation based in disciplinarity. What we lose sight of, when looking at this issue from a disciplinary perspective, are the students and their perception of collaboration (and I don't think we can separate collaboration from interdisciplinarity), when faculty resist cooperating with one another but demand that students, each with different abilities and ways of doing things, work together to arrive at a common goal. At the end of each semester's experiment, most faculty return to their departments, dismayed by the end results and even more assured that the place of writing -- at least in the freshman year -- is in the English department.

Reconciling the Disciplinary Divide

Distinct and Disparate Goals?
University Support?

Second, we'd like to have a writing center, and I'd like to find champions for it (that means people who are interested enough to actually work in it) in both the College of Science and Liberal Arts and the Newark College of Engineering, but I have to find a way to sell it to two audiences with different ideas of what should happen there. I have our old guard English staff, trained in belletristic pursuits, custodians of the cultural elite, uncomfortable with their historic role as a service wing to the other disciplines, and I have a large number of engineering and science faculty who complain *en masse* that these students can't write.

I've been thinking about the supposed opposition between the objective prose of engineering and the so-called expressive thrust of composition pedagogy, in order to see if one's resistance to the other's definition of what writing should be might be overcome and the work of an interdisciplinary engineering writing center can begin. If we can find an answer to that one, there's a larger question to consider: How can a university demonstrate its commitment to interdisciplinarity beyond tolerating individuals like me who try, perhaps unwisely, to make it work? While I don't know how to answer the second question, and given the enormity and complexity of universities, I doubt if I'll find one, I'd like to suggest one answer to the first question and see if we can talk about the subject in depth while we're here.

Assumptions and Approaches

Epistemology: Postivist vs. Expressivist
Models: Structure vs. Discourse

We are all familiar with the stereotypical assumptions and definitions of "Good Writing" suggested by compositionists and engineers. Engineers see a product, a deliverable, one that shows us only what we need to know, keeps the data and not the writer in the forefront, and has objectivity acting as the watchword controlling the entire text. Compositionists stereotypically think of writing as a rhetorical rather than a technical act. We like the active voice bringing the writer right into the fray. We privilege the process of discovery, of academic inquiry. Engineering's technical documents have a monologic style, complete with assertions of authority, segmented information and a heavy dose of the imperative mood. These have product-oriented models behind them. Compositionists like invention; subject matter needs to be discovered. Writing has a dialogic tint to it. We highly value a recognizable, individual voice, one that's suggestive, enticing us to read on, respond, and relish the process of uncovering new knowledge. If there are models involved, they are inventional, describing how the mind organizes information. Now, I'll ask you all, can we link a professional orientation toward the solution of problems together with an academic orientation toward the development of knowledge through discourse?

Available Options

Analogical Models and Intersubjectivity
Strategic Action vs. Communicative Action

I think we can, and to get there we might start borrowing from each other. We can try combining and rearranging the product and process models we use individually and separately. For all of us who remain on one side of the divide, my suggestion is to combine two seemingly unrelated positions -- Victoria Winkler's idea that there can be a positive relationship between model and discourse, and that the model to adopt is a specific kind of analogic one -- and Susan Wells's call for an intersubjective pedagogy, one that tries to "identify the rhetoric of strategic claims to authority, consider the relation between strategic claims and the purposes and goals of writing, and suggest how these claims can be contested"(108).

Rather than continue with an approach designed around manifest or direct analogy, such as those that formulaic or strategic, formatted models propose, we might use an imported analogy, where an analogue is drawn from a place different from the subject of the writing. We find a means of discovery by helping to describe and explain the unfamiliar, making room for imagination, intuition and innovation. Many students respond positively to this approach. For example, in literature electives, I ask students to use principles, techniques and theories of their engineering and science majors to explain their understandings of the creative texts they're reading. The same strategy, but from a different direction, can be employed in engineering classes, where narrative becomes the strategy of employing imported analogies to help students explain how they learned to assemble a circuit, calibrate a rotometer, or find an innovative use for a slider-crank mechanism.

Recommendations

Adopt an Imported Analogy Model
Arrive at a Strategic-Communicative Consensus
Provide an Intersubjective Arena

I'm suggesting that freshmen import analogies from other subjects and other experiences in their lives to help them reach and understand new information, then explain it through rhetorical modes that fall outside the recognized formats of a discipline. Is there a place for narrative in the laboratory? Can freshman composition as well as upper level engineering courses adequately address objective information through description of the process of discovery?

I close with these questions because I think we need to continue the process of change, starting in first year courses, if there's going to be a true collaboration between faculty in different disciplines. When we agree to cede a little turf to promote a common end we can begin to lower the disciplinary walls. I'm suggesting that before a provost and a faculty, historically entrenched in disciplinarity, will be willing to support interdisciplinary efforts, we have to show them that we have a common goal. And that common goal needs to be based in a pedagogy of communicative action, where students express not only what they know but how they know it and why or how they might question what they know. But to make this happen, both sides need to start reading holistically and responding comprehensively to writing projects drafted collaboratively.

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Integration of English and Engineering in a Freshman Engineering Course

Dave Bryenton
Department of Engineering
Burlington County College

The following are the notes for a progress report Bryenton delivered to the workshop. Here he discusses a course collaboratively designed by Engineering and English faculty.

Introduction

Burlington County College is a small two-year college, located near Philadelphia, Pa., which formed a joint high technology campus with New Jersey Institute of Technology, offering two-year, four-year and graduate degrees.

Recently, our dean asked two Engineering professors and two English professors to develop a freshman course of three credits each, in Engineering and English, linked together. This was similar to courses offered currently at NJIT and at Drexel University.

We offered the linked courses in fall of 1996, with six contact hours in Engineering and three contacts in English, to three sections, including about 45 students. Design teams were formed with 4-5 students apiece, the same teams in both classes.

Course Objectives

1) to present an introduction to the profession of Engineering.
2) to improve the ability of Engineering students to
   a) write English well.
   b) speak English well.
   c) work well on projects in teams.

Course Content

1) Small group design projects.
2) Memos, surveys and progress reports about each project.
3) Mechanical engineering topics related to design.
4) Electrical engineering topics related to design.
5) Entrepreneurial topics related to business.
6) The design and hands-on manufacture of one small metal part for each team.
7) (Each part was made on a CNC mill.)
8) Engineering graphics topics related to manufacturing & design.
9) A videotaped dress rehearsal of the final presentation.
10) A videotaped final formal presentation by each team about their respective projects.

Educational Tools Employed

1) 24 Silicon Graphics work stations networked to one server.
2) Autocad(R) v12 software.
3) Emco-Maiers CNC Milling Machine.
4) Visiting Engineers from industry. (Each engineer visited each design team for 30 min. at the beginning and the end of the course.)
5) 90% paperless classroom, where all drawings were made, graded and stored on computer.

Results

1) Eight mock-ups and one working model of student team projects.
2) An acceptable formal presentation from each team about their project.
3) A set of working drawings from each team about their project.
4) One working model of a programmable electric door lock for the home.

Conclusions

1) The additional effort required, over presenting a traditional course, was very worthwhile.
2) The initial offering of the linked courses probably had too much content.
3) Outside visiting engineers with specialties similar to student projects were very helpful.
4) Courses need much refinement.
5) Collaboration between Engineering and English professors working together on this course development was challenging and very rewarding.

Recommendations for the Future

1) Require a formal report of each team.
2) Promote more integration of topics between courses.
3) Refine videotaping technique.
4) **Reduce course content by 10%.**
5) Store progressive graphics lecture problem solutions in read-only files for student use.
6) Upgrade software to Autocad v13® and/or Pro Engineer®.

BREAKOUT SESSION: INTEGRATING PROFESSIONAL COMMUNICATIONS INTO THE ENGINEERING PROGRAM

As the previous papers by Thompson, Fentiman, Miller, Bausser, and Friedman indicate, collaborative research provides opportunities for inter-disciplinary faculty from English and Engineering to share ideas, ideas that are foundations for improving communications in engineering education. Through the process of Interactional Inquiry, members of both disciplines interact with each other, drawing out vital concepts that can serve as bases for the development of writing programs in Engineering.

Beginning the Process of Collaboration and Interactional Inquiry

Putting collaboration and Interactional Inquiry into practice, this breakout group sought to discover ways to integrate professional communications into the engineering curriculum. Eight members made up this group: Nancy Thompson and Kris Walker from the University of South Carolina facilitated the discussion. Tom Ward, also from USC, recorded ideas and main points in order to provide an accurate picture of the group's interactions and the information generated as a result. Other group members from the fields of English—Deborah Bosley (University of North Carolina at Charlotte), Bernadette Longo (Clemson University), Dianne Carr (Midlands Technical College)—as well as Engineering—David Rocheleau (USC), Chick Glagola (University of Florida)—brought their experience and expertise to the table and provided various viewpoints gained from their institutional environments.

Originally beginning as one group, the members focused on establishing a writing program for engineering technology students. Many discussions ensued, some heated, about the role of grammar in writing programs, the role of writing centers and engineering faculty in teaching students writing, characteristics of "good" writing in engineering, the various audiences engineering students eventually must write for, creating effective writing assignments, and the conflict writing teachers often encounter teaching students to write for two worlds: educational and professional. In addition, the group agreed that both creative problem solving and critical thinking skills united in effective technical writing.

Collaborating further by Diversifying

As a result of these discussions, the group eventually split in two to discuss two different workshops that would facilitate the integration of writing into the engineering curriculum. Group 1, composed of Tom Ward, Kris Walker, Bernadette Longo, and David Rocheleau, created a workshop titled "Using Feedback and Comments to Enhance Engineering Students' Writing Skills." The content of this workshop, previewed by the PowerPoint slides and brief paper that follow, reflects this group's emphasis on teaching engineering faculty to respond to

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their students' writing through writing center collaboration. The workshop outline not only contains practical exercises involving both writing center and engineering faculty but also lists writing philosophies that workshop participants will be encouraged to accept and promote.

Group 2, including Nancy Thompson, Deborah Bosley, Chick Glagola, and Dianne Carr, developed a workshop based on creating meaningful writing assignments. Beginning with a discussion about department vs. university- and college-level writing centers, this workshop outlines the functions of a *departmental* writing center, lists characteristics that an engineering writing assignment should include, and illustrates a possible writing assignment that engineering faculty might use in their courses. In addition, the group included a possible response to the assignment to facilitate discussion among workshop participants about the criteria for an effective response. The following PowerPoint slides illustrate how this workshop material might be presented.

During two days of inter-disciplinary collaboration, these two groups developed two workshops that could be conducted at any of the institutions represented. Bernadette Longo later wrote that she had planned a workshop for faculty at her institution based on the material developed during her group's discussions. This application illustrates the rewards both of inter-disciplinary collaboration and Interactional Inquiry for writing center personnel and engineering faculty.

Using Feedback and Comments to Enhance Engineering Students' Writing Skills: A 3-hour Workshop for Engineering Faculty

By Tom Ward, Kris Walker,
Bernadette Longo, David Rocheleau

Target Audience

- Engineering Faculty who rely on writing in their classes

  - Freshmen Year Experience Seminar Instructors.
  - All instructors who wish to incorporate writing in traditionally non-writing assignment courses
    - Engineering Faculty with Laboratory requirements.
    - Design project faculty.

Writing Feedback Workshop for Engineering Faculty

Purpose of the 3-hour Workshop

- Establishing dialogues about writing in engineering.
- Writing as a means for expressing critical thought.
- Increasing the comfort level of engineering faculty to respond effectively to their students' writing.
- Modeling feedback and response to enhance effective communication.

Writing Feedback Workshop for Engineering Faculty

Presuppositions

- The importance of distinguishing between observation, inference, and evaluation.
- Writing is both a *process* and a *product.*
- Writing with *structure* and *creatively.*
- Writing is an *evolutionary* process.

Writing Feedback Workshop for Engineering Faculty

Intended Outcomes

- Examples of *teachable* observations.
- Exercises to promote good communication skills.
- Modeling the responding process.
- Proper use of drafting and revision.

Writing Feedback Workshop for Engineering Faculty

Workshop Preparation

Prior to the workshop all participants will receive, review, and comment on a collection of 10 "typical" student writings compiled from the previous year.

Writing Feedback Workshop for Engineering Faculty

Preliminary Program

0:15	Introduction. Goals, presuppositions, and expected outcomes.
0:45	Breakout for small group consensus for comments on sample writing.
0:15	Break
1:00	Presenting and discussing as a group—comparing and contrasting Engineering comments vs. WC comments.
0:30	Commonly accepted vocabulary for commenting.
0:15	Revisit presuppositions and summary comments.

Writing Feedback Workshop for Engineering Faculty

Summary

It is hoped that this workshop will be the beginning of an ongoing dialogue which will continue in future workshops.

Possible future workshops:

- Development of writing assignments appropriate for all levels of engineering students.
- Journal writing in the context of engineering courses.
- Construction of engineering laboratory notebooks.

Writing Feedback Workshop for Engineering Faculty

Modeling Methods for Integrating Writing Into an Engineering Curriculum

- University Writing Center
  - Is the resource necessary to overcome apathy
- College Writing Center
  - College support for Department Centers
- Department Writing Center
  - Proximity to the need (too far to walk)
- Overcoming Barriers Between Disciplines
  - Left-brain/Right-brain, Visual/Textual

What a Departmental Writing Center Will Do

- Develop (through a "team" of engineering faculty and Writing Center faculty) a blueprint for student enrichment
- Conduct seminars to orient Departmental (engineering) faculty to the need (ABET 2000)
- Follow-up Workshops to develop Curricula-based Assignments for Writing Development
- Provide a continuous feed-back loop that will keep everyone "onboard" (sustainability)

Problem Development Considerations

- AUDIENCE - What do you know about the intended audience and how did that information help you make the decisions below?
- PURPOSE - what are the purposes for this document?
- CONTENT - how did you decide what to include/exclude?
- ORGANIZATION - how did you decide the order of the information?
- STYLE - how did you decide what terms to use, to define, etc.?
- FORMAT - how did you decide what format (headings, space, etc.) to use?
- ILLUSTRATIONS - how did you decide what graphs to include and where to put them?
- ASSESSMENT - Students must know how they will be assessed.

Example Assignment

- Engineering Economic Analysis
- Classical problem requiring a quantitative response only
- Supplemented by an assignment challenging the student to:
  - examine the reasoning supporting the quantitative response
  - develop their abilities to communicate the fruits of their labor
- Meeting the requirements of ABET 2000

Written Assignment Supplemental to Standard Engineering Problem Assignment

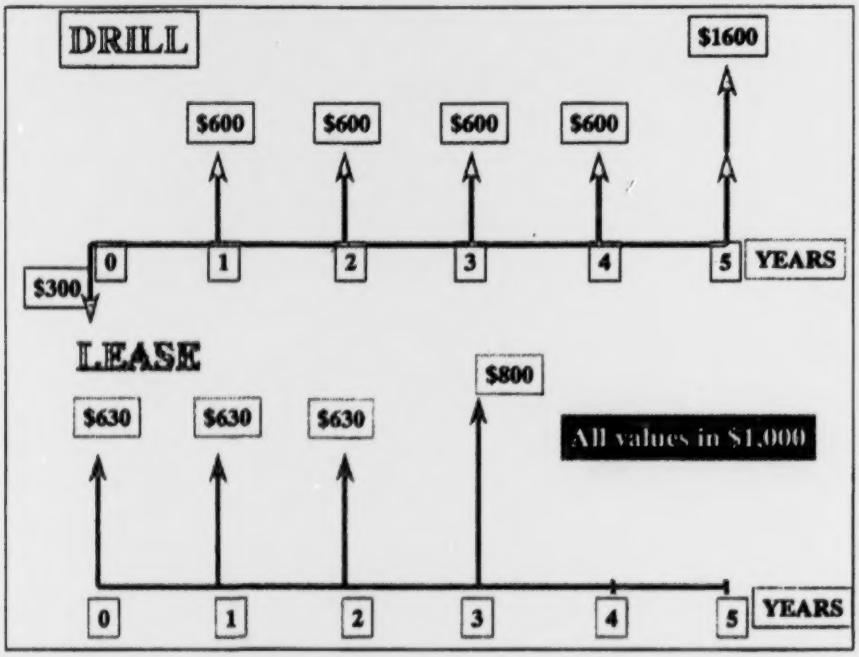
The family-operated Foothills Ranching Company (FRC) owns the mineral rights for land used for growing and grazing cattle. Recently, oil was discovered on this property. The family has decided to extract the oil, sell the land, and retire. The company can either lease the necessary equipment and extract and sell the oil itself, or it can lease the land to an oil-drilling company. If the company chooses the former, it will require $300,000 leasing expenses up-front, but the net annual cash flow after taxes from drilling operations will be $600,000 at the end of each year for the next 5 years. The company can sell the land for a net cash flow of $1,000,000 in 5 years when the oil is depleted. If the company chooses the latter, the drilling company can extract all the oil in 3 years, and it can sell the land for $800,000 in 3 years. (The difference in resale value of the land is due to the increasing rate of land appreciation anticipated for this property). The net cash flow from the lease payments to FRC will be $630,000 at the beginning of each of the next 3 years. All benefits and costs associated with the two alternatives have been accounted for in the figures listed above.

a. Which option should the firm select at i = %15? Draw cash flow diagrams

b. From your analysis, comment on the advantages or disadvantages of the two options and what choice you would make. Give specific logical reasons for your decision that would be understandable as a recommendation to the FRC officials.

Cash Flow for FRC Problem

n	Drill	Lease
0	-$300,000	$630,000
1	$600,000	$630,000
2	$600,000	$630,000
3	$600,000	$800,000
4	$600,000	
5	$1,600,000	



New Present Worth (NPW) Calculations

DRILL

NPW (15%) = - $300,000 + $600,000(P/A,15%,4)
+ $1,600,000(P/F,15%,5) = $2,208,470

LEASE

NPW (15%) = $630,000 + $630,000(P/A,15%,2)
+ $800,000(P/F,15%,3) = $2,180,210

CONCLUSION:

Net Present Worth (NPW) of the Drilling operation is economically more advantageous by $28,457

41

Sample of Written Assignment Response

The relatively small difference between the two NPW amounts ($28,457) suggests that the actual decision between drilling and leasing might be decided on non-economic issues.
Even if the drilling option were slightly better economically, the company might prefer to forego the small amount of additional income and select the lease option rather than undertake an entirely new business venture and do their own drilling. A variable that might also have a critical effect on this decision is the sales value of the land in each alternative. The value of land is often difficult to forecast over any long period of time, and the firm may feel some uncertainty about the accuracy of its guesses. We might want to perform a sensitivity analysis to further investigate this consideration.

STUDENT SUCCESS

The Plenary Session on Student Success included presentations by three participants who represent three different institutional perspectives but who share the common goal of student advocacy. The opening presentation, by Dr. Robert O. Pettus, emphasized the Department Chair's concern for and the Department's emphasis on student needs. Student advocacy is one of the ECE Department's primary areas of emphasis in their goal to have their students reach self-actualization, and Pettus demonstrated the various support components and programs that the ECE Department has in place or in development.

Deanna Ramey presented a case study about a student for whom the ECE Writing Center served as a means to build self-confidence and to learn to cope with the sometimes frustrating demands on an engineering student's time. She emphasized the Writing Center's role as student advocate and its presence as a "safe place" for students to share their views. Stephanie Metts' presentation centered around a discussion of the unique perspective of an engineering student who works as a technical advisor to the Writing Center. The knowledge that the Technical Consultant has faced the same courses and labs gives many students a feeling of comfort. This provides a valuable connection with students and their concerns.

Student Advocacy through the Professional Communications Center

Robert O. Pettus
ECE Department
University of South Carolina

In this paper, Professor Robert O. Pettus discusses the concerns that he, as Chair of the ECE Department, and the Department as a whole, have for the welfare and development of their students. Using Maslow's hierarchy of needs as a starting point, Pettus describes the Department's latest endeavor to create a stimulating and inviting learning community. He then discusses the programs that the ECE Department already has in place for helping students. Finally, Pettus explains the fledgling Assessment Program that will begin in fall 1997 and how the program is designed to guide ECE students throughout their four-year careers at USC.

ECE Writing Center and Student Self-Actualization (Getting the Pilgrims up the Mountain)

At ECE, we use Maslow's hierarchy of needs as a management tool. In our department, as shown in slide 1, we use the term "pilgrim" to refer to the student who is a true believer and who will go the extra mile. We want the students to feel good about themselves, and our interaction with the Writing Center has helped us move from a vague, desirable, fuzzy goal to something that is literally institutionalized.

Support Component

- **Evaluation:** As shown in the second slide, the biggest thing we've learned is that we didn't understand the idea of advocacy very well. But we do understand evaluation: At the end of the course, some live and some die. Some get an A; some get an F.
- **Assessment:** We also understood assessment. We're familiar with ISO9000, ABET 2000, and the idea of continuous improvement of the program. We found that ECE and

the Writing Center shared an interest in assessment. The Writing Center's idea of assessment, however, is a little different. They said, "We don't assign grades. Nobody lives or dies here. You come into the Writing Center, and you have a positive experience. We don't talk to the teacher. We are here to be the student's advocate." This attitude changed our view of writing, and I began to see improved writing in our students as a beneficial side effect.

- **Advocacy:** The student advocacy that the Writing Center staff provides is a huge benefit to our department. If I've got students who are having trouble, which is usually no reflection on their brightness (it might be personal problems or self-esteem problems), I take them by the Writing Center. Unfortunately, because we're professors with a variety of obligations, the kids don't get all of our attention. But at the Writing Center, somebody listens to them. We think this is an important component of success, and the students think so too.

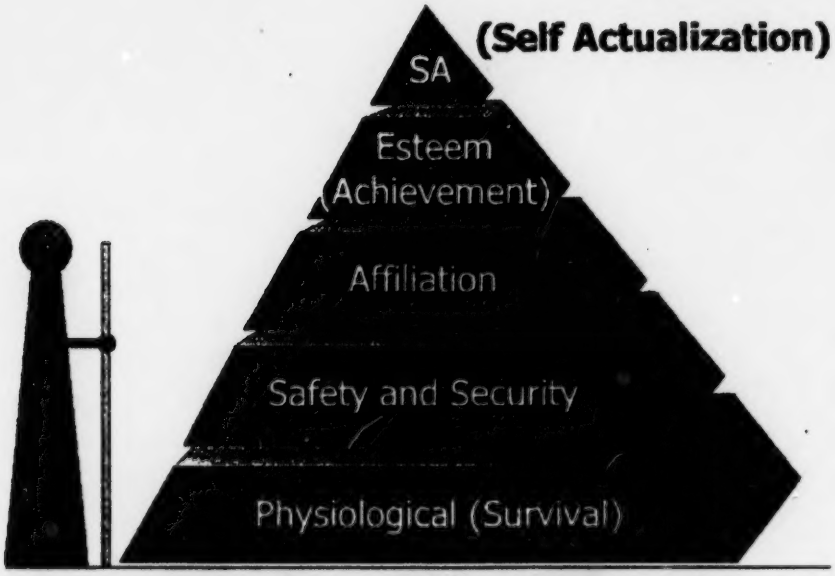
SPECIFIC PROGRAMS

- **Writing Consultation**: The Writing Center has about 1,000 consultations per term. Not everybody goes, so it averages out that the people who go have about 3 visits each.

- **Laboratory Instruction**: In our lab instruction, some of the teachers have been English graduate students providing writing instruction. There is some evaluation involved with these roles, but the main point is that the teachers are helping students with their writing and communicating.

- **Advisement and mentoring**: We are starting a new program this fall. It is a fairly involved advisement procedure, and we'll have a full-time counselor. We want the students to be able to work on time management throughout their educational careers, and they'll update their long-range plan each semester. We want to get comments from the students about what's working and not working. We think the Writing Center can help us analyze this anecdotal information using qualitative assessment and evaluation techniques. We plan to use this advocacy at the group level to help us develop a better curriculum and a better environment for our students.

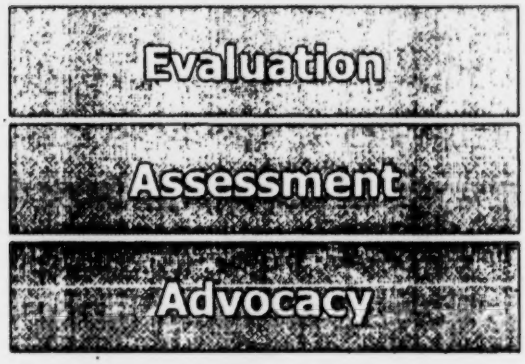
THE ECE WRITING CENTER AND STUDENT SUCCESS



Getting the Pilgrims up the Mountain

Slide 1

SUPPORT COMPONENT



Institutionalized Concept

Shared Value

Writing Center Concept

Slide 2

SPECIFIC PROGRAMS

- Writing consultation
- Laboratory instruction
- Advisement and mentoring

Slide 3

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Building Student Confidence through the Writing Center

Deanna E. Ramey, Writing Consultant
ECE Writing Center
University of South Carolina

Deanna Ramey presents an overview of how the ECE Writing Center has become a place where students feel comfortable airing concerns and addressing issues in addition to receiving help with their communication skills. She explains how the Writing Center strives to maintain its role as a "safe place" for students. She then discusses a case study of a student who successfully used the Writing Center to negotiate a period of frustration with the demands of the engineering field of study.

The Writing Center – A Safe Place

One of the unique aspects of the ECE Writing Center derives from our conscious and concerted efforts to separate the Writing Center from any connection with grading. We have close associations with several engineering courses like the EECE 201 lab course. But we work very hard to keep our identity separate from the evaluative/grading parts of the course. If the students perceive that we have influence over their grades, then we become part of "the system." Therefore, we try to keep our role as clearly defined as possible – and our role is as the student advocate, to help the students become better communicators. I think that is the first critical step toward building student confidence about seeking help with their writing and other communication projects: providing them with a SAFE PLACE.

"I'm a Bad Writer"

Once we get students inside the Center, I have often heard statements like this on a first visit:

- "I'll just go ahead and tell you that I can't write," or "I hate writing."

This initial defensive statement is often uttered before any other consultant or I have even spoken. It's as if these students, aware that they are entering a domain where their "nemesis"—English or grammar—reigns, must erect a shield to protect themselves so that you will not expect them to be good writers. We use the technique of having students read out loud, and when they see one of their grammatical mistakes, they are very quick to point out "I

misspelled that" or "I missed a comma there." Once we don't jump on them and say, "Boy, you really *are* a bad writer. You're one of the worst I've ever seen," they begin to relax and don't feel so defensive.

This self-protective posture is not even remotely a clue as to what the student's abilities are as a writer. Some of our best writers make statements like this as well as some writers who actually are struggling with the task. In most cases, once sessions get underway and students figure out that we aren't going to pounce greedily on every comma or misspelled word, they relax, and we get down to the serious business of strengthening their work. Students who have few serious problems often don't become regulars. However, they frequently tell peers who *are* struggling about the help they can find in the Writing Center.

When Bad Writing Really Isn't Bad Writing

Sometimes bad writing doesn't mean you are a bad writer; it can be symptomatic of other problems that a student is having. One thing I've noticed about engineering majors is that they get overextended very easily. It is a demanding core curriculum that they have to take and very time-intensive. For example, the 201 course that we work closely with can easily consume 10 hours or more from students each week. They have 12 or 13 labs to do during the semester. Each week they have a 2-hour recitation, 3 hours of lab work to perform, and then it usually takes 4-6 hours to perform the calculations and write up the lab. Then they have four other courses to take, some of them co-op, some of them have jobs during school, and if you factor in a social life, eating, sleeping, and breathing, they're pretty busy people.

A Case Study

Students who are having serious problems acclimating to the demands of an engineering curriculum can use the Center as a sounding board for problems other than writing. We can spend a few extra minutes with them, talking about reasons for their frustration or difficulty in managing a problem. I once had a member of a writing group in the second year lab course who was seriously struggling with 201. She almost always fell asleep during our group that met in the late afternoon. I asked her why she was so tired and was amazed by her answer. This student was taking a full engineering course load and working nights at a restaurant. In between, she had homework and labs to do. When was she *supposed* to sleep?!

The student and I talked about alternate arrangements, and she began to meet with me at a time when she was less sleepy and could focus more on her work. That allowed us to cover the material that she needed. This student couldn't very well tell her professors about her busy schedule, and they weren't asking. However, it was important for her to know that someone in the Electrical and Computer Engineering Department cared why she was tired.

I cannot "prove" that this interaction with the Center enabled this student to pass the 201 course. But I believe that the personal encounter that this student was able to find, at a time when she was exhausted and frustrated, helped her realize that the ECE Department was not a dehumanized entity. Rather, the Department has people and places where a frustrated student can vent and receive validation as well as suggestions about how to address the academic problems that are part of any college career.

An Engineering Student's Role in the Writing Center

Stephanie Metts, Peer Technical Consultant
ECE Writing Center
University of South Carolina

In this paper, Stephanie Metts describes how an engineering student works with writing center consultants whose backgrounds are in English or Composition. She reflects on the importance of providing students who come to the Writing Center with a consultant who can identify with their discipline-specific concerns. She explains how her role as a Technical Consultant took shape in the ECE Writing Center and offers compelling reasons to combine the expertise of consultants from different fields in writing center consultations.

Most writing centers are staffed with consultants whose backgrounds are concentrated in English. Therefore, many consultants would confess that they do not always have the best suggestions when offering alterations that deal with a discipline specific vocabulary or manipulating certain types of software packages. Since both of these criteria are necessary for producing a formal engineering laboratory report, the addition of an engineering student to the writing center's staff is essential. Not only can the engineering student assist other students with computer problems and the proper use of technical terminology, but the student also becomes a writing center representative that other students can talk to inside or outside the writing center.

Aiding Development of Computer Skills

For many of the first semester laboratory students, writing formal reports can be an overwhelming experience. Many of the computer software packages needed to compile the report are being introduced to them for the first time, and students have trouble learning how to operate these programs. As an engineering student in the writing center, I help students adjust to the demands of report writing by assisting their learning of the computer software. This aid includes answering computer and software questions, demonstrating software uses, and helping in the merging of several varieties of software (graphical, drawing, word processor) which best piece together their reports.

Assisting with Technical Terminology

In addition to learning new computer programs, students are using specific engineering terminology in reports for the first time. I help them learn how to properly word a particular component's description or analysis of lab data. Common questions center on whether or not a detailed description or brief overview is needed for a certain section of the report. Along with developing writing techniques, I guide the students in the formatting of their reports. This assistance involves finding the proper location for circuit diagrams, tables of data, plotted graphs, and deciding if these items need extra documentation or if they are self-explanatory.

Connecting Engineering Students and Writing Center Consultants

As a student, one of the most comforting feelings is to be able to talk to another engineering student who has already experienced the challenges I am facing. Having an engineering student in the writing center provides this connection to students. Therefore, students are more willing to visit the writing center. Also, advice writing center consultants give students is heeded more closely when the engineering student provides stories for verification. For instance, our writing center staff always stresses that writing a formal report can be time consuming. Many students have a difficult time realizing the truth of this advice. But when I mention it takes me days to complete a report, students are more willing to listen to the counsel of the writing center staff. In addition, the engineering student becomes an accessible person that is available to help students inside and outside the writing center office. Last semester, I found that it was very convenient for students to ask me questions while I was working in my lab, in classes we were taking together, or just passing in the halls. These opportunities allowed students who had "quick" questions to avoid a scheduled meeting in the writing center.

In addition to helping students, the engineering student supplies information to the writing center consultants. For our writing center staff, I provide a perspective of how an engineering student views many topics, including writing in general, work habits, and class demands. Answering these questions gives the consultants a clearer understanding of an engineering student's thinking patterns and responsibilities, which allows them to better relate to the demands of the students.

As an engineering student working in the Electrical and Computer Engineering Writing Center, I feel that I have helped to bridge a gap between the writing center consultants and the engineering students. Knowing that I still experience similar challenges, the students do not hesitate to ask me questions. With the assistance of an engineering student in the writing center, students will continue the development of their communication skills, which are essential for future classes and career requirements.

BREAKOUT SESSION: ESTABLISHING PROFESSIONAL COMMUNICATIONS CENTERS

When the breakout group on establishing professional communications centers first met, they began by talking about their institutions and the student populations they served. The group included Jennie Ariail, Martha Thomas, and Stephanie Metts from USC-Columbia, Terry Ward Tucker from USC-Lancaster, Alan Grier from Midlands Technical College, and Deran Hanesian and Rob Friedman from NJIT. This group represented a diverse group of institutions—a major research university with a student body of 25,000, a two-year regional campus with an open admissions policy, a multi-campus urban community college with about 10,000 students, and a metropolitan college which began as an engineering college and now, with an enrollment of 8,000, offers degrees in engineering, architecture, management, the sciences and liberal arts.

Collaborating to Explore Organization of Writing Centers

Although they represented institutions with very different cultures, members of this breakout group soon realized that they shared a common conviction that such centers are unique and vital resources for teaching emerging professionals to communicate effectively. The group also recognized that establishing a new discipline-specific communications center or expanding an existing one calls for considerable groundwork, planning, promotion, and funding. Therefore, using the process of Interactional Inquiry, the breakout group explored essential steps in developing a proposal for a new or expanded center. Group members who had no experience in establishing or managing a discipline specific writing or communications center asked numerous questions of the experienced writing center directors in their midst. They talked about organizing centers, finding funds, developing programs, and gaining the kind of administrative support that is necessary for a successful center. Their questions and concerns were specific: how many consultants per student population are needed? What is the desired educational level and background for the director and consultants? What kind of space is needed? How about computers, supplies, resource materials, tables and chairs? As they talked about specific needs for writing centers in their own institution, members of the group recorded and reflected on their ideas.

Expanding the Purpose of the Inquiry

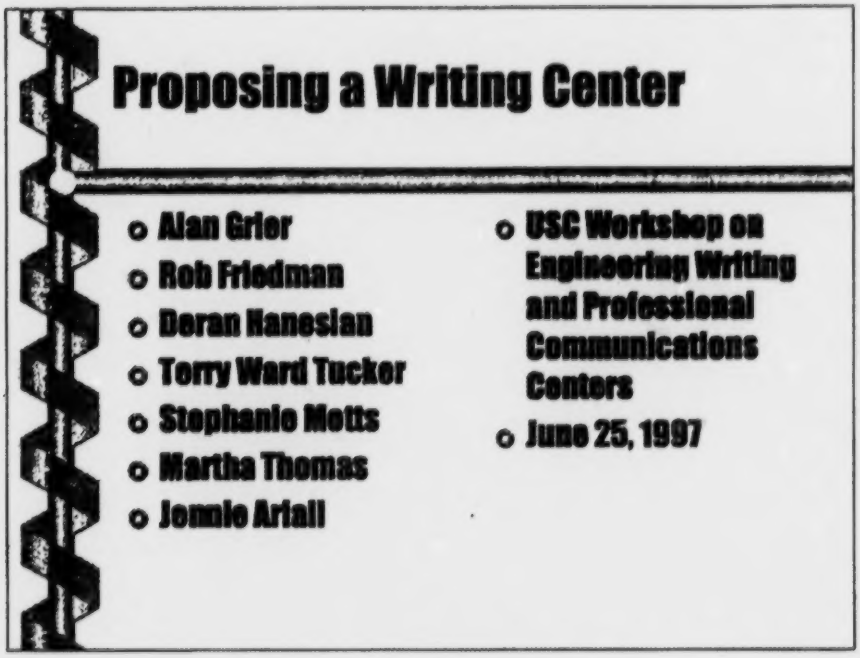
And from the group's collaborative inquiry, a broader purpose emerged. The breakout group decided to refine and condense their exploration to provide information to institutions involved in planning discipline-specific communications centers. They created the following objective for their work:

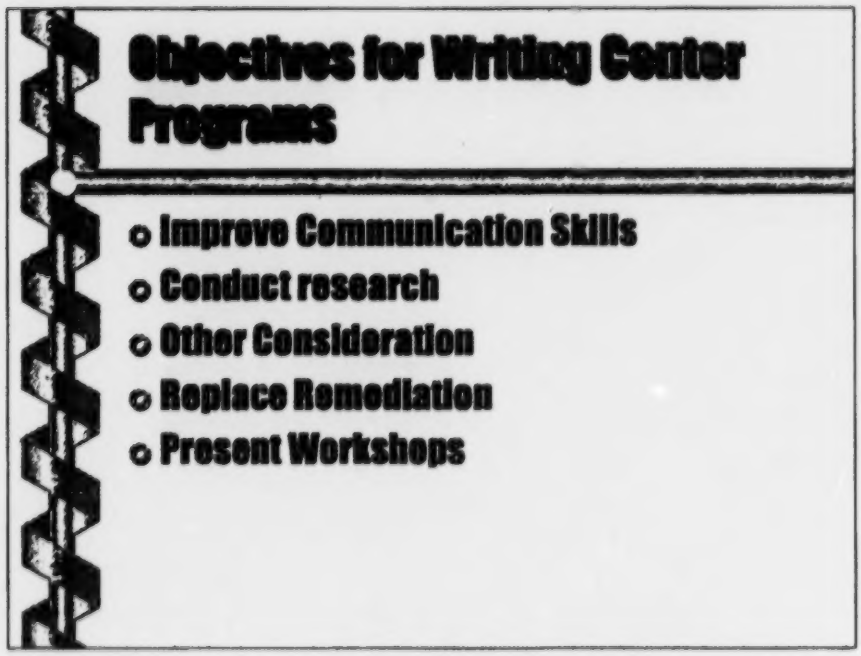
Objective: To create a working outline that anyone trying to craft a proposal to create a writing center, or expand an existing writing center, or develop a discipline-specific writing center can use as a guideline.

Developing Proposals for Writing Centers

Members of the breakout group recognized that individuals attempting to get a discipline-specific writing or professional communications center started in almost any institution would need to develop a proposal. The proposal might be a document to persuade administration of the need for the center, or it might be a request for funding. Such a proposal could have multiple purposes and audiences. To provide guidance for developing a proposal, the breakout group created a Prototype Proposal for a Writing Center, which they explained to the Workshop participants with the PowerPoint presentation that follows. The prototype proposal, though in outline form, could serve as a heuristic in writing a proposal for a center to meet the needs of students in a particular institution.

The conversations that enabled the group to create the prototype are another demonstration of the ways that inquiring together can produce new information that benefits the entire group.





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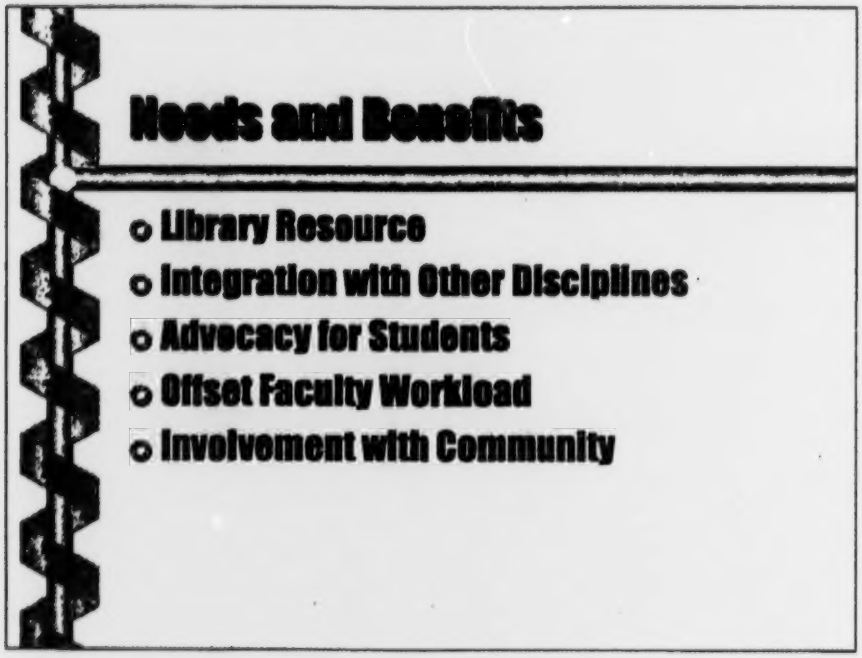
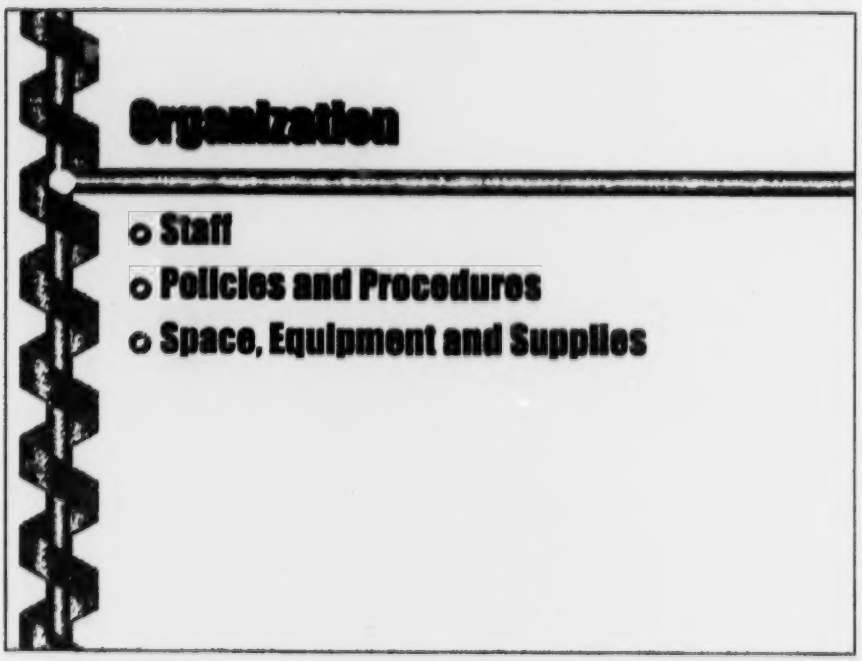
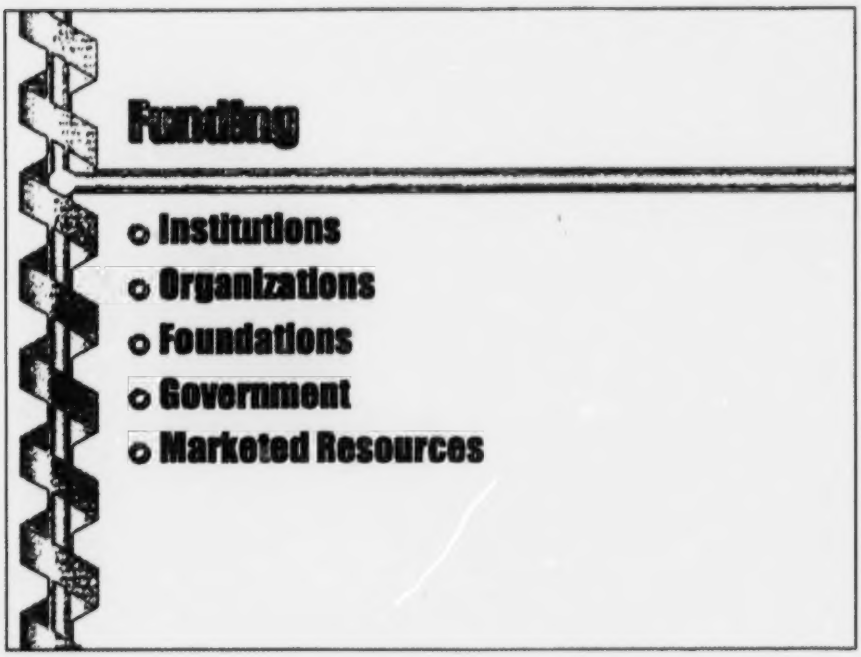
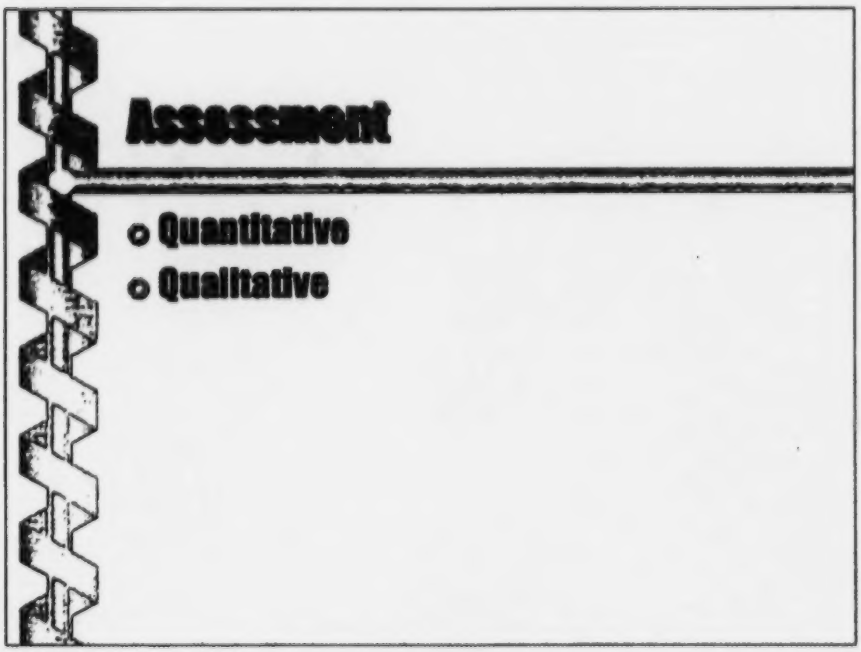

Needs and Benefits
Library Resource
Integration with Other Disciplines
Advocacy for Students
Offset Faculty Workload
Involvement with Community


Organization
Staff
Policies and Procedures
Space, Equipment and Supplies


Funding
Institutions
Organizations
Foundations
Government
Marketed Resources


Assessment
Quantitative
Qualitative

Prototype Proposal for a Writing Center

(Breakout Group—Establishing Professional Communications Centers)
Jennie Ariail, Stephanie Metts, Martha Thomas, USC-Columbia;
Terry Ward Tucker, USC-Lancaster
Rob Friedman, Daran Hanesian, NJIT
Alan Grier, Midlands Technical College

A proposal for a writing center should include the elements indicated below. In addition, where appropriate, we have included specific suggestions and examples that came out of our group.

Objectives for Writing Center Programs

- To improve the communications skills of all students to better prepare them to meet the demands of the twenty first century.
- To conduct research on the professional communications of a particular discipline.
- To conduct ongoing research on the work of the writing center similar to a meta-analysis that then informs the pedagogy of the writing center and provides publishable research that informs classroom pedagogy.

Other factors for Consideration and Justification:

Needs

- **Replace remedial courses**
- **Change perception of writing instruction as service role**
- **Improve presentation skills**
- **Improve written communication**

Benefits of a Writing Center for the Students

- **Planning papers**
- **Organizing a report**
- **Using scientific format**
- **Citing references**
- **Making sentences clear**
- **Proofreading own work**
- **Solving writing problems**
- **Writing team reports**
- **Becoming a more confident writer**

Benefits of a Writing Center for the Faculty
As ally to faculty, the writing center offers:
Support in making students better writers
Workshops on design writing assignments
Workshops on responding to student writing
In class presentations on topics such as documentation, writing abstracts, punctuation, taking essay exams etc.
Consultations on any writing problems in particular students' papers and professions own writing
Library of books, examples of writing process
Helping to integrate writing in the curriculum
Help to incorporate more writing without additional work to teach

Benefits of a writing center to the institution (Outreach:)
Presentations to government and business groups as well as individual consultations
Representation of the institution to the public
Enhance reputation by quality of graduates
Help to meet ABET 2000 requirements
Conduct summer workshops for high school teachers

Organizational Structure
Staff – training, orientation
Policies (e.g., Attendance – voluntary or required)
Room, computers, supplies, equipment
Library of resources/references
Technical Consultants

Assessment
Quantitative
Qualitative

Sources of Funding
Institutional
Government
Industry
Foundations
Marketed services

JOB DESCRIPTIONS FOR WRITING CENTER DIRECTORS

Qualifications of Director

Skilled in Communication between Disciplines
Background in Composition and Rhetoric
Interpersonal Skills (Oral Communications)
Terminal degree for that institution
- **Ph.D. for a 4-year institution**
- **Masters for a 2-year institution**

Responsibilities

Hiring and training staff
Assessing the needs of the institutional unit (students and faculty)
Reporting to supervising authorities/making recommendations
Scheduling
Managing the Budget
Promoting and publicizing
Developing Outreach (to community, inter-institution workshops, etc.)
Assisting in securing funding (coordinate with Development office)
- **Setting research agenda**
- **Participating in professional organizations/reading journals**
- **Marketing services**
- **Publishing**

PROFESSIONAL COMMUNICATIONS CENTERS—RESEARCH AND DEVELOPMENT

Before conducting research about and within writing centers, and before focusing on the development of one, it is important to consider the educational history that produced writing centers. Writing centers have undergone considerable evolution during this century: perhaps the first "writing centers" were led by professors who discussed individual student's papers in class. "Labs" and "centers" were established to cope with the increasing number of students flowing into academia during the open-admissions era of the 1960s and 1970s. During this time, writing centers have survived multiple identity crises as well: they have been considered "hospitals" and "clinics" where "sick" writers go to be cured. Writing centers also have been promoted as places where students can find people to respond to their writing, not merely to grade or "correct" it. Students often can find allies and advocates in writing center consultants. Writing center history is decorated with multiple images and metaphors, many of them reflecting the results of research (or lack thereof) being conducted within their walls.

Research has become an integral part of establishing disciplinary writing centers in Engineering. This research is based on ethnographic research methods (such as interviewing faculty about engineering writing and studying engineering genres), current engineering education trends and philosophies (such as team collaboration, reflective practice—both part of the social constructionist education movement), and the relationship that all of these components have to preparing students for workplace writing demands. Research closely aligns itself with disciplinary writing center development. The unique, complex writing environments in technical disciplines can be better understood through collaborating with faculty and gaining knowledge about various technical genres. Such inquiry requires qualitative research strategies. All three papers presented during this session discuss history and research strategies that provide foundations for writing center development.

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History and Current State of Writing Centers

Jennie Ariail
Writing Center Director
University of South Carolina

Jennie Ariail explores the histories of writing centers that shape our current ways of perceiving the work that writing centers do. Drawing on different accounts about writing center origins, Ariail sets the stage for the context of the University of South Carolina's Humanities Writing Center, which she directed for several years. She encourages readers to continue efforts to establish writing centers, for those efforts can have far-reaching effects, as the Humanities Writing Center has illustrated by being the parent of several satellite writing centers on the USC campus.

As a child I used to sit through hours of family stories from the master storytellers in my family—grandmother on one side and grandfather on the other. I was sometimes bored; my mind often wandered, and I never paid very careful attention to the details. Now I have reached the age when I realize the value of the stories they were telling me—the importance of these stories as they both inform my life and influence not only who I am but the work that I do.

My adult realizations provide the rationale for telling you today about two different theories of how writing centers began. The stories we tell ourselves about our origins define the work that we do, support the theories that undergird and inform our pedagogy, and determine our present status in the academy. My abstract promised theory, but theory is difficult to read much less to listen to and in keeping with the spirit of this interactive conference, I didn't want you to go to sleep on me. Anyway, the stories we tell ourselves apply to the general history of writing centers as well as the more recent history of writing centers and writing center satellites at the University of South Carolina.

For many years Stephen North's seminal work, "The Idea of a Writing Center," guided and directed our thinking about writing centers. We accepted his theory that writing centers first grew out of the influx of both nontraditional and first-generation college students during the open admissions of the 60s and 70s. He marks their inception with the 1972 publication of Lou Kelly's From Dialogue to Discourse ("Research" 25). North explains that writing centers were separate from classroom instruction, devoid of any connections with the

classroom or instructors, and as in our own writing center, offered workbooks and guided exercises for students.

However, compositionist Peter Carino offers an alternative to this theory, explaining that writing centers received their impetus from the lab structure of science classes. They began as early as the 1904 high school English class of Philo Buck and evolved from the classroom setting where the instructor intervened in the writing process, offering individual help and establishing peer groups (105). The classroom instructor often stopped a lecture and walked around the room, reading portions of each student's paper, talking to students about their work, and perhaps most importantly letting students talk about their writing. The work of Fred Newton Scott, another pioneer in the field of composition in the late nineteenth and early twentieth century, suggests that he may have used these same techniques as he tried to "reunite written and spoken discourse" (Berlin 82); and of course, the history of rhetorical education, indeed, rhetoric itself, reflects the oral tradition.

By the late 1940s, the influx of students going to school on the GI bill and the push for communicative competence fostered the growth of these writing labs which continued as adjuncts to classroom instruction as professors monitored the labs.

Ironically, the negative view of labs as remedial, fix-it shops for "inferior" students did not come into vogue until the lab severed ties with the classroom. Viewed from Carino's historical perspective, writing centers may question the assumption that their genesis was solely remedial, to correct problems of weaker students.

The Writing Center at the University of South Carolina, part of the English Department since its inception, has a complex history that reflects both of these explanations for the origins of writing centers. Begun in 1975, with a five-year grant from the National Endowment for the Humanities, this Writing Center seems to have been a "lab," as Carino defines the term, with close ties to classroom instruction: it was originally named the Writing Lab, designed for upper level students in English, and faculty members participated in the tutoring process.

The name was changed to The Writing Center in the early 80s when the time allowed for student conferences was expanded from fifteen minutes to an hour. These years—through 1988—might be viewed as the golden years for the Writing Center, as reflected in "community outreach, popular workshops, positive responses from students and faculty" (Dimedio 49) and, most importantly, connections with the Composition and Rhetoric program at the University, which had been established in the late 70s.

However, in the late 80s, with changes in administration both in the English Department and in the Writing Center, the Writing Center slipped into the mode of remediation. With budget cuts, the loss of a tenure-track professor as director, and a reduction in the number of staff members, the Writing Center struggled until one of its former directors returned to revitalize it. According to one member of the English Department, "The success of the Writing Center always depended on the energy, etc. of the Director. Some had it, some didn't." The implication of this statement is that the environment created by each director influenced the work and perception of the Writing Center and the Director's energy also influenced the efficacy of the staff.

These environmental shifts had a direct bearing on the affect of the staff of the Writing Center. Between 1975 and 1988, the staff saw themselves as effective members of the academy; they were busy, productive, actively involved in workshops and individual sessions with students. But, when the history reflects a fall from grace, the small staff, according to one member, felt that they had very little impact on students, and they spent much time alone in the Writing Center, feeling separated both from the English Department and from the University.

However, today is an exciting moment in the Writing Center as it resumes its place in the academy, once again becoming a vital part of the entire academic program at the University. (And you can tell how new all this is for us by our struggle to name the original writing center so that it is separate and distinct from the ECE Writing Center. Libby sometimes calls it the Humanities Writing Center; I often call it the Writing Center in the English Dept., but frequently I resort to an explanation rather than a title, saying that the Writing Center serves students from all disciplines on campus.) The work of the Writing Center has been re-defined as a research project that fits into the mission of the University of South Carolina.

First, convinced of the possible potential of the Writing Center, the Provost appointed an interdisciplinary university-wide task force, chaired by Professor Nancy Thompson. She taught us the research method she explained yesterday, Interactional Inquiry, and directed the Task Force as a research project in which we each contributed not only our own knowledge but collected material from various sources and together studied writing centers. This Task Force, in a lengthy and detailed report to the Provost, proposed a plan that would fund the Writing Center through the central administrative budget but would leave the Writing Center with an academic home in the English Department under the direction of the Composition and Rhetoric division.

One of the important results of this activity has been the creation of the model program in the Department of Electrical and Computer Engineering (ECE), where the director and staff work closely with professors to improve not only the writing skills of engineering students but their oral skills as well. In addition, on our campus, we have had a Writing Center satellite in the Athletics Department, albeit short-lived, and now have a Writing Center Satellite in Housing. Through the generosity of Libby and Jerry Hudgins and the staff here as they have taken their show on the road and presented their work to other departments, we will soon have a Writing Center in the Department of Business Administration and the Medical School. Libby and I have met with the College of Applied Professional Sciences, and their real world connections convince them that they need a writing center satellite. And we know they need us, but the Law School has been a tough resistor. Sooner or later, we'll get them.

To return to my introduction—the stories we tell about our origins shape the present realities. So I urge those of you who are considering bold new steps by creating a writing center, or expanding an existing center, or integrating writing and oral presentation more fully into the curriculum to chose your history well. I offer to you the programs here not as models for you to adapt but as models that always define and advertise themselves, often shamelessly, as ally for faculty and advocate for students. That is, after all, the key.

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Research and Development of Professional Communications Centers: Today and Tomorrow

Elisabeth M. Alford, Director
ECE Writing Program
University of South Carolina

Elisabeth Alford, director of the ECE Writing Program at the University of South Carolina, draws on both engineering education pedagogy and ethnographic research methods in her paper. Using the illustrative concepts of team projects and reflective practice, Alford discusses the continuing influence in engineering education on the social construction of knowledge, a concept that the ECE Writing Center also supports. She emphasizes the collaboration with engineering faculty that has contributed to the success of the ECE Writing Center and discusses ways writing center pedagogy prepares students to succeed in the workplace.

Today, as in the early 20th century when writing center pedagogy was viewed as a natural adjunct to classroom teaching, writing centers can be quite effective complements to classroom and laboratory instruction in the technology professions. However, to make sure that discipline specific writing centers serve their intended purposes, we are advised to pay as much attention to the environment in which they exist as we do to the pedagogical practices within the center. We need to understand how professionals in a discipline create meanings, how they work together and alone, and how they define good work.

When the first group of English faculty, Writing Center directors, and Composition and Rhetoric scholars arrived at ECE in the summer of 1995, we made a conscious effort to understand our new environment. It was the only way we could develop a program of writing consultation that would meet the needs of students and the goals of the department. As I describe the ways that we went about studying the culture of engineering when we started the ECE Writing Center, I hope to begin building a description of the broader contexts of engineering writing centers to aid future collaborative efforts that other institutions may undertake. At the same time, as I describe some of the opportunities that the engineering environment offers for exciting and valuable research on writing in the workplace and in the professions, I hope to encourage the development of new partnerships between engineering and the field of composition and rhetoric.

Research by Walking Around

First, to provide a little background about my approach to research and how I used it in learning the culture at ECE, I need to tell you its name: I call it "research by walking around" because we used qualitative or ethnographic methods that rely on observation and conversation. (I patterned the title after Tom Peters' use of the phrase "management by walking around" in his book, *In Search of Excellence*.) Almost immediately after Jennie Ariail, Nancy Thompson, Bob Pettus, and Jerry Hudgins agreed to start the ECE Center, I was called in to do "rhetorical analysis" of engineering writing. We looked at sophomore lab reports—dozens of them—and decided we'd rather do something else. So we proceeded to interview engineering faculty, engineering students, and engineers in the workplace. We asked about good writing, about writing on the job, about proposals, all kinds of questions about writing. We listened. We analyzed this qualitative data. We learned a lot about engineering faculty's frustrations with writing - with the students' writing yes, but more important - their frustration with explaining to students what was wrong with a report and what needed to be done. We also heard about the faculty's frustration with team writing – especially when some distant member of the team wasn't writing up to par.

In these interviews, we also learned that engineering professors were accessible to students and to us, that they cared about the quality of communications, and that they really want to improve the teaching of communications skills. We also found that they were using some very sophisticated approaches to teaching, approaches that reflect the theory of the social construction of knowledge. However, the engineering faculty had not yet applied their very advanced pedagogy to the teaching of writing. So in our faculty workshops we have tried to talk about writing in ways that show the neat fit between engineering pedagogy and writing center pedagogy.

With that as background, I want to talk about the place of discipline specific writing centers – or professional communications centers today – from two perspectives: the relationship between writing center pedagogy and the changes in educational theory and 2) the relationship between writing centers and changes in the workplace.

Writing Centers and Current Theories of Knowledge and Learning

In the past few decades, our view of the creation of knowledge has taken a radical shift. Once we regarded knowledge as facts outside us that the individual learner could amass through what Freire calls the "banking" method of pedagogy – or perhaps we could call it the direct deposit method. Just make regular deposits of knowledge into the brains of the learners during lectures and eventually they accumulate a storehouse of facts and theories. Now we know that knowledge is socially constructed through language in the process of dialogue or collaboration. This theory of the social construction of knowledge explains why writing center conversations between consultants and students often help students figure out what to say and how to say it. Oddly, we writing center consultants often say the students figure out the solutions to writing problems "on their own" while the writing consultant merely listens and asks questions - though obviously, asking questions and listening to the answers are excellent pedagogy.

Today, much of the current pedagogy in engineering reflects the theory that knowledge is socially constructed. Two outstanding illustrations are team projects and the concept of reflective practice.

- ***Team projects:*** The use of group or team learning and team projects in engineering colleges may be a direct response to industry emphases. We may think we are teaching students how to work in teams primarily as a way to prepare them for the workplace. More important, however, the use of team projects also reflects academia's growing acceptance of the evidence that team learning is more effective and efficient.

- ***Reflective Practice***: Engineering educators have wisely adopted the approach which Donald Schon labeled "reflective practice." As Schon explains, the student learns to design by designing --- and then by getting feedback from a coach - an experienced designer who can help the novice develop her own design schema through practice and reflection on the design process and results. This strategy, like the teamwork approach, is grounded in the theory of social construction of knowledge.

Foundations for Success of Engineering Writing Centers

Those of us who are associated with the ECE Writing Center are conscious of the connections between current writing center theory and the pedagogical theories of engineering. We believe that our writing center program and writing centers in other engineering settings have worked well because they are built upon dialogic methods of research and teaching. These methods help learners assume responsibility for their own learning as they talk out their understanding of the main points of a lab report, for example. We also believe that writing centers in engineering are effective when they are integrated into an engineering curriculum that is built on team effort, active learning, and individual responsibility.

Potential Obstacles for Engineering Writing Centers

For all of the advantages of integrated writing and professional communications centers in engineering, there are several potential obstacles – or guarantees of disappointing results. The first, I believe, are practices or attitudes which reinforce the misconception that a writing center is a remedial program, a program only for those students who need extra help, or only for those with real problems in grammar. When students perceive the discussion of writing and communications as somehow remedial or punitive, they are not likely to understand the relationship between talking and writing. They may have difficulty talking with team members about writing. And they may have extreme difficulty in writing for the real audiences of the workplace.

A second potential obstacle is the belief that after a successful engineering or discipline-specific writing center program has been put in place, no further collaborative development is needed. Quite the contrary, if the engineering faculty and writing specialists do not continue to collaborate in research and development, the writing center program will become stagnant and eventually fail to meet the needs of students and faculty. (It's a long time commitment – engineering changes so rapidly that we all wear track shoes/ and the writing center must keep up.)

Collaboration between faculty and writing center staff has been one of the pluses in our ECE Project. The key to this collaboration, we think, is that engineering faculty and writing center staff share some common understandings of what we are about. These mutual understandings include:

- mutual recognition (by engineering and writing center faculty) of the role of the writing/communications center in helping students acquire knowledge of their discipline as well as the ability to communicate that knowledge. (Because of this shared vision, students, faculty, and administration tend to see the center as a place of learning, not as a place of remediation.)
- mutual recognition of the contributions of engineering to writing center pedagogy, through their experience and research in teamwork, collaboration, and active learning, including the principles of reflective practice.
- mutual recognition of the role of writing/communications centers in helping graduates succeed in their careers by providing opportunities to practice interpersonal, group, and formal written and oral discourse.

This last requirement points to the need for action that goes beyond merely recognizing the value of what writing centers are currently doing. And that action would consist of collaboration between engineering faculty and writing centers in establishing links to industry and other future employers of graduates so that writing and communications programs can teach authentic forms of engineering discourse. Such a move would capitalize on writing centers' contribution in preparing future engineers to communicate well in their professional careers.

Writing Center Pedagogy and Success in the Workplace

I can safely assume that everyone here shares a belief that instruction in writing and speaking well is beneficial for the undergraduate engineer—and that such instruction may indeed help a number of individuals become excellent communicators and successful engineers. Many of us also are convinced that writing and professional communications centers can expand that number and maybe help students benefit even more from their academic experiences.

But writing centers offer engineering students a particular advantage in preparing to work in the current technological environment. That advantage, of course, is the practice that writing center visits give the student in interpersonal communications, collaboration in solving problems and explaining solutions, and communicating with team members so that work gets done and the report gets written. Throughout the process of collaborative communication in the writing center, students receive supportive feedback that lets them understand how listeners hear and readers read. Students working in writing groups also learn the vocabulary of communication and thus are better able to help other writers in the workplace.

This special role of the writing center uniquely prepares students for working in the environment of the learning organization as described in Peter Senge's *The Fifth Discipline*, a best selling work on business organization forms. As Senge explains, the "discipline of team learning involves mastering the practices of dialogue and discussion." He later elaborates on the skills that allow dialogue and discussion: these are the skills of inquiry and reflection that

allow the individuals involved to gain insights that simply could not be achieved individually"(237-41).

The principle that Senge articulates is one that has been guiding writing centers for decades -- - but until recently, writing centers have had no avenue to explain their approaches to representatives of high tech firms. Now, the team of Engineering and English has the opportunity not only to explain what we're doing but also to create alliances with industry that will enrich our research into the communications and team learning skills that our graduates need to acquire.

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Research for Writing Center Development

Kristin Walker, Assistant Director
ECE Writing Center
University of South Carolina

Kristin Walker focuses here on two specific ethnographic research methods essential to the ECE Writing Center's success: becoming familiar with the engineering culture and analyzing engineering writing. Becoming familiar with the engineering culture involves studying professors' writing and understanding important issues within engineering education, such as retention and addressing the needs of minority and women students. Analyzing engineering writing involves interviewing faculty about effective characteristics of lab reports and conducting genre analysis to further determine qualities of effective writing within ECE. All of these research methods proved vital for developing a discipline-specific writing center within ECE, and Walker suggests that they are also crucial for creating other discipline-specific centers.

Writing in Electrical and Computer Engineering (ECE) is different from writing in English literature. Many of us would agree with this statement. Engineering writing is often considered technical writing, complete with calculations, data, observations, graphics, and a to-the-point writing style. Writing in Electrical and Computer Engineering must be designed to communicate facts quickly and accurately to an audience with some technical background, but the audience may not have specific knowledge of the certain experiment that the writer is writing about. On the other hand, writing in English literature might be characterized as more essay-ish. And, perhaps more importantly, the facts are open to interpretation.

At the University of South Carolina (USC), students who are taking their first lab course in ECE have been trained to write in English classes, and they have not had experience writing Engineering lab reports. In the past, students were not instructed in this department about writing; the students simply had to learn through trial and error. This learning process was complicated by the fact that writing requirements change from class to class, based on professor expectations and course content. All of these components tend to confuse students about what good writing is within their field.

When the ECE Writing Center at USC opened in 1995, we as consultants were also confused about what good writing was in this department. Even though we all had received training in

Composition and Rhetoric and had taught English to students at a variety of levels, we were very conscious of the differences between writing in English and writing in Engineering. In order to learn about the kinds of writing that students would need to practice in order to be successful in their future classes in ECE, we had to develop research strategies. This paper describes some of the research strategies that proved vital to our success and survival as a new Writing Center in a department that had never had a writing center before. Perhaps this description will be helpful to those of you who already have writing programs in Engineering or who are considering implementing such programs.

Becoming Familiar with the Engineering Culture

When the Writing Center first began, we realized that we couldn't just come in and take over the writing instruction because we knew little about the culture of ECE. In order to help students write within ECE, we had to familiarize ourselves with the ECE culture and understand the purposes of writing within it. To learn more about the culture, we read, listened, and talked.

Since we knew we would be helping students with their writing, we found examples of Engineering writing and read them. We read articles that ECE professors had published in scholarly journals; we read research studies that had been published about writing in Engineering and Writing Across the Curriculum programs; we learned what articles professors were requiring students to read for specific assignments in their courses, and we read those. We also tried to familiarize ourselves with issues discussed in Engineering education, such as the need to integrate writing more within the entire Engineering curriculum and ways to encourage the participation of minorities and women in Engineering.

In addition to reading about the issues, we also listened to them being discussed, such as in the halls or in classrooms. Since there is a strong emphasis in Engineering on collaboration and teamwork, a common occurrence is seeing faculty discussing an issue, article, problem, or course with each other in the halls or in their offices. Since we were sometimes in a position to participate in these conversations, we did, often by just listening. We would also sit in on classes in order to gain information that might help students when they visited the Center. By just listening, we learned even more about issues such as retention that concern the faculty, and we became exposed to the Engineering classroom environments.

This exposure provided us with more information to discuss with the faculty and to help students with when they visited the Center. The more we listened to faculty, studied Engineering writing, and participated in classes, the more we were able to converse with faculty about Engineering writing and education issues. We asked faculty specific questions about writing, such as, "Why do engineers use the passive voice instead of the active voice?" We discussed format conventions with them and learned about the rhetorical uses of graphics. And we learned about the Engineering persona and the ways engineers can convey authority through their writing. In addition, the Engineering emphasis on collaboration and teamwork prompted us to seek input from the faculty on designing small writing group sessions for the lab courses.

Through asking questions and entering into conversations with the Engineering faculty, we were able to establish contact with them and learn what they felt were important

characteristics of writing in their field. Because we had read about and familiarized ourselves with issues and departmental concerns, we created some common ground between the faculty and us. On this common ground, the ECE Writing Center began to flourish.

Familiarizing Ourselves with Student Writing and Assignments

Another kind of research we did was looking at student samples of good writing that had been commented on by professors. The professors' comments gave us an idea of the writing characteristics they felt were important. In addition, we examined the reports and essays, making notes about other characteristics we wanted to ask professors about that they may not have commented on. As writers from a different field, we realized that certain characteristics we might feel were important would not be important to Engineering writing. For example, in the introductions to lab reports, we wondered if certain pieces of equipment or terms should be defined or if specific thesis or "preview" statements are needed. We weren't sure how these definitions and statements helped to create the Engineering persona. As we communicated with professors, using the students' papers as examples, we learned that depending on the audience, some definitions are optional, while other definitions should generally be clarified.

Along with the students' papers, we also looked at the assignments that prompted the students to write the papers. The assignments contained certain words, such as *analyze, measure, calculate, observe,* etc., that gave us clues as to the types of processes that professors would like for students to emphasize in their reports. Once we knew the points that the professors wanted their students to emphasize, we could guide students better in the Center by determining if their reports contained similar emphases.

This kind of analysis of the students' writing in particular caused us to begin to develop a list of evolving generic characteristics for EECE 201 reports. (This course, Tools and Techniques for Electrical and Computer Engineers, has had significant involvement with the Writing Center since the Center began.) When I wrote my dissertation on the genre of lab report writing for this course, I created a list (List 1) of eleven characteristics that appeared to be important for this genre.

List 1:
Features and Discourse Strategies that Suggest Generic Knowledge about EECE 201 Lab Report Writing

1) Stating the purpose of the project—why it was undertaken
2) Definition sentences in the introduction
3) "Thesis" sentences/paragraphs
4) Topic or definition sentences at the beginning of sections
5) The absence of imperative verbs and extensive narrative format
6) Passive voice
7) Consistent tense
8) Coherence devices
9) Numbering and labeling figures and discussing them in the text
10) Handling unexpected results/errors competently

11) Generalizing beyond a specific learning situation in the conclusion

The list is not all-inclusive, and it is not prescriptive, but it attempts to reflect the genre that these students are learning. This list serves as a tool we can use to discuss students' lab reports, and, while the characteristics may apply in a general way to many other kinds of Engineering writing, they provide an entryway to discussing *more specific* generic requirements for the course.

Interviewing

After analyzing examples of students' essays, as well as professors' comments on them, professors were interviewed to ensure that our ideas about generic characteristics were accurate. This type of interviewing takes place all the time on an informal basis through e-mail and conversations in the hall, but for my dissertation, I wanted specific responses to a set of questions about the list of eleven characteristics that I created. In order to gain this feedback, I interviewed two faculty members who had been involved with the course, and I also interviewed the graduate teaching assistant. Their responses revealed the complexity of the characteristics, as well as the fact that the generic characteristics can change, to certain degrees, depending on who is teaching the course.

For example, when asked if students should include definitions in the introductions to their lab reports, one professor said not to define trivial things, but he remarked that for the student, it would be difficult to know which definitions might be trivial and which ones would not be. Another Engineering professor stated that if the report contained a lot of equipment, then the equipment should be defined, unless it had been used and defined previously in other lab reports. And the teaching assistant said that he preferred students to not define equipment and terms explicitly but instead to define the equipment through the techniques they use in the lab. Integrating the equipment with the lab processes through writing is part of the Engineering educational experience, according to the teaching assistant.

When asked about including specific "thesis" sentences or an overview statement, the teaching assistant stated that he would like to see a statement about what students hoped they would learn in the lab, rather than a statement about the report's structure. One of the Engineering professors said that a "thesis" statement was hard to read and usually didn't grab a reader's interest, but that previewing the report's organization is good. The second Engineering professor indicated that a thesis statement would be "useful," but the statement's scope depends on the length of the report. If the report is short, a more general, rather than explicit, thesis statement may be necessary.

While these interviews did complicate the discussion of generic characteristics, they also provided a richer, more global perspective, a perspective that allowed us to provide students with more information about the genres in which they were writing.

Conclusion

This paper has discussed a variety of ethnographic research methods that were essential to the development of the ECE Writing Center; these methods were also essential to the development of genre analysis characteristics that serve as an important teaching tool. The

research processes began with becoming familiar with the Engineering culture within this department. Reading, listening, and talking all were a part of this process. Then, analyzing sample student papers with professor comments helped me draft a list of specific characteristics that we could then seek feedback on from the Engineering faculty, who are experienced writers in their field. This interview process provided even more information than the analysis of students' papers did alone, and it established further ties between the Engineering faculty and us as we tried to meet their students' needs.

All of these research methods are fluid in that they grow and change the more that we learn about the Engineering culture, generic characteristics, and students' needs. And, as time passes and technology continues to advance, the Engineering culture, generic characteristics, and students' needs will change, as well. Learning about all of these areas is a constant process.

This discussion has been part of an evolving story about the ECE Writing Center within the ECE Department here at USC. While these research methods have worked very well for us, we realize that they may not directly transfer to helping others in different departments who are interacting with different faculty, different students, and different genres. I hope this information has been of some help to you, though, and if you have any questions you would like to discuss about these issues, please let me or one of the other consultants know.

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BREAKOUT SESSION: TA TRAINING

The TA Training breakout session entertained wide-ranging discussion over the course of the workshop. The participants in this session were:

- Libby Alford, University of South Carolina (USC)
- Dave Bryenton, Burlington County College
- Audeen Fentiman, The Ohio State University (OSU)
- Jean Gallagher, Polytechnic University
- Nadia Medina, Tufts University
- Paul Miller, OSU
- Randy Miller, USC
- Deanna Ramey, USC
- Tom Smith, USC

Members of the group described their programs to one another, outlined concerns they had and, ultimately, decided on a plan for describing some basic elements of TA and tutor training that are absolutely vital.

The first portion of the group's report to the entire conference included basic principles for planning, discussing and responding to assignments (text follows).

Then, the group emphasized the importance of communication among faculty, staff and TAs. According to the group's presentation, faculty need to model open communication for TAs. They need to reply promptly to TA requests and to encourage and accept input.

A number of important points about the structure and pedagogy of TA/Tutor Training were discussed. Group members reminded conference participants that the strategy for training programs should incorporate time for TAs to meet with one another and exchange ideas about teaching. The group also felt that training should be an ongoing, semester-long process that encourages continuous improvement. TAs and Tutors need to be involved in any training program rather than lectured to. Therefore, the group recommended practice paper-grading sessions in the case of TAs; real conferences about their own writing in the case of tutors. Also, the group emphasized and concurred with Jean Gallagher's view that engineers already have vital observational skills that serve them well in responding to writing.

In the final segment of the group's presentation, members reminded conference participants that TAs need to model the uses of technology for students. This means encouraging them to communicate with students via e-mail and set up a web-site for their courses. But it also means being willing to spend a little extra time preparing students to use various applications vital to writing and engineering.

On the following pages you'll find, first, a text which summarizes the first portion of the presentation, and, second, PowerPoint slides which outline the group's presentation. Finally,

the group compiled a selected bibliography of resources that will be helpful to anyone who trains novice teachers.

Planning, Discussing and Responding to Assignments

TA Training Breakout Session

Most TAs, at some point, give, explain and respond to assignments—quizzes, tests, lab reports, and other kinds of writing. Often, however, they aren't given much training. It's assumed that TAs have few questions about assignments since they have successfully *completed* assignments for a variety of classes. Unfortunately, experience completing assignments is not enough because past experiences don't always mesh with our current understanding of effective teaching practices. We hope the following tips will help you think about assignments in a systematic, rather than a nostalgic, way.

Whether you have to develop an assignment or explain it, there are some questions that you should ask yourself, your professor, and your students about the assignment. Students in particular *need* to be encouraged to ask questions about assignments. After all, once they apply for jobs and get them, they'll need to be able to ask appropriate questions about tasks they're given. Sometimes, teachers think students' questions come from poor reading or listening skills; try to avoid this assumption. A question is another opportunity you have to reduce your workload when you grade the assignments.

Discussing and Planning Assignments

- **What is the purpose?** Try to state and prioritize the things you hope a student will learn by completing the assignment.
- **Who is the audience?** Almost invariably, students identify the teacher as their audience. And they're right, to a degree. But most writing assignments require students to imagine a slightly larger, more ignorant audience. For example, the information included in most lab reports is information that a group of students similar to the writer could use to learn concepts new to them. The teacher already knows this information.
- **Are there models?** Most students new to engineering have written essays for English and other Humanities classes. But these essays barely resemble the appearance of the average engineering writing assignment. Students need to see—and need time to adjust to—the new forms of writing that engineering requires.
- **What formal guidance has been given?** Typically, assignments are given to students on a sheet or two of paper. Often, professors or TAs will discuss the assignments during the class in which they're given, adding to or amending information on the assignment sheet.

When students ask questions—and when they don't—encourage them to look closely at the assignment sheet with you and jog their memories of class discussions.

Responding to Writing Assignments

- **Prioritize Comments.** It is unnecessary to comment on everything you notice about a paper. If you comment on sixteen formatting errors and once on the student's incomplete analysis section, it appears that formatting is your biggest concern. Also, make sure that your comments are based on the purposes of the assignment you and/or the teacher outlined when you planned it. Finally, remember that students are different even though they're writing in response to the same assignments. It is important that you consider these differences when you comment. Some students are better able to take direct criticism than others; some are further along in their understanding of engineering writing. These variables are inherent to teaching any group of students at any level. New teachers often feel like the quantity of comments is inversely proportional to the quality of writing. But the quantity and character of comments should be related to the amount of information you think a student can and will internalize in order to improve the next assignment. Don't view yourself as an editor; view yourself as a teacher.
- **Make Positive Comments.** Most teachers point out the problems with students' writing; this is certainly part of the job. But positive comments can be just as effective at teaching as negative ones. Too often for students, writing is only about avoiding a series of land mines they know they're prone to; but rarely have they been told positive things they're prone to and can repeat with confidence.
- **Focus on Substantive Comments.** In order to be effective, both positive and negative comments need to be detailed. Instead of writing "X is good," write "X is good because..." This takes more time, but, if you're prioritizing your responses, you'll be making fewer of them.
- **Observe.** TAs, particularly in engineering, already have observational skills that can allow them to respond to a piece of writing. Instead of resorting to a vague comment like "This is unclear," attempt to phrase the comments like this: "I don't understand the relationship between X and Y." Such a comment allows you to comment on a problem without solving it yourself, putting the ball back in the student's court.
- **Identify and Look for Essential Content.** Try to identify ahead of time the kinds of things that are essential to successfully complete the assignment. Questions that prompt the student to think about missing essential content are usually of the highest priority.

You'll get better and better at assigning, discussing and grading assignments if you put in the effort to observe and evaluate the successes and failures of them—always keeping in mind that the primary goal of an assignment is to encourage learning.

Explaining Assignments

Responding to Assignments

Tips

Bibliography

Discussing Assignments

- Audience?
- Purpose?
- Models?
- What questions should the paper answer?
- What formal guidance have you been given?

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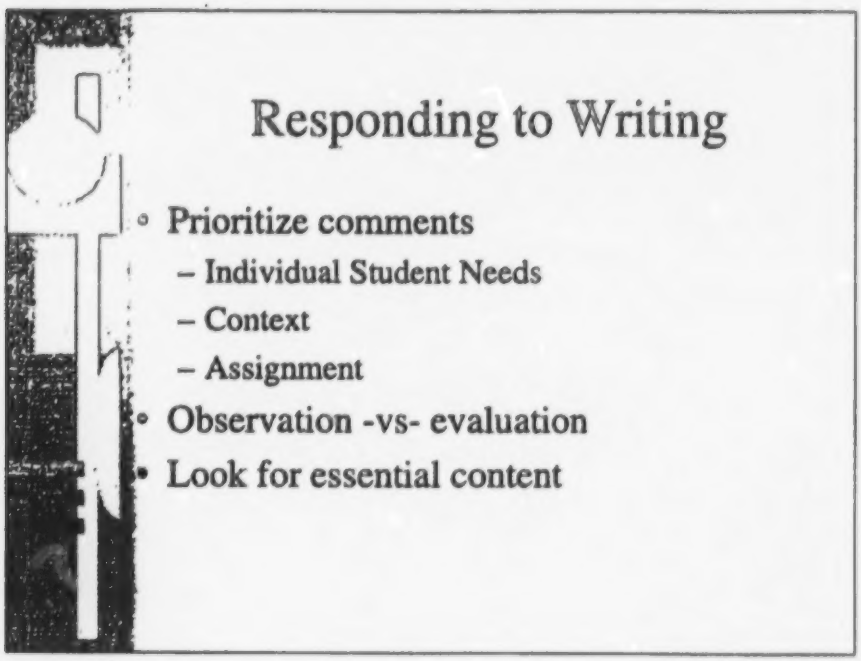
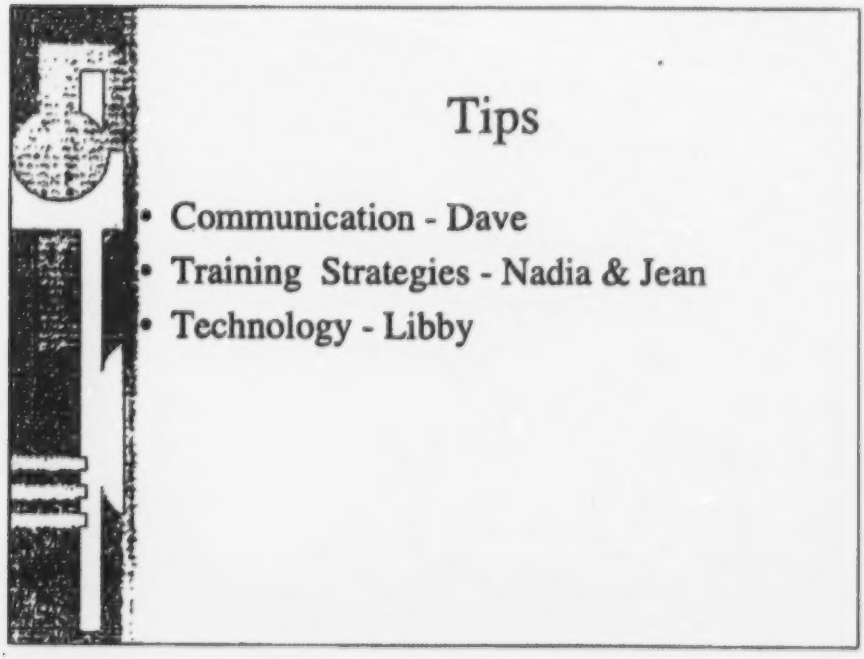

Responding to Writing
Prioritize comments
– Individual Student Needs
– Context
– Assignment
Observation -vs- evaluation
Look for essential content


Tips
Communication - Dave
Training Strategies - Nadia & Jean
Technology - Libby

Resources for TA Training and Teaching Writing in the Engineering Curriculum

This brief bibliography includes three types of resources. First, it contains guides for faculty and administrators who supervise TAs and oversee their training. Second, the list includes several basic guides to teaching, including one on teaching engineering, which provide useful advice and suggestions for new teachers. Third, the bibliography lists works that either describe strategies for teaching undergraduate writing in the disciplines or contain materials for teaching writing.

TA Training

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TRAINING AND ASSESSMENT

Two vital aspects of both engineering and composition studies are training and assessment. At large and small schools alike, TAs and tutors (be they graduate students, undergraduates, or staff members) are vital components of curricula which include communications instruction. However, the styles and levels of training differ dramatically. While in some cases TAs and tutors are asked to enroll in a course to learn teaching methods, in others, training lasts for only an afternoon. The styles and levels of assessment at various schools are equally diverse. Sometimes, assessment is primarily located in each classroom, the instructor or TA having sole responsibility for designing and assessing student work in progress. In other institutions, assessment occurs at the department, college or university level.

The Accreditation Board for Engineering and Technologies (ABET) offers engineering colleges specific criteria for assessing their activities. At the same time, the Conference on College Composition (CCC) offers composition teachers a basic principle of assessment: it should inform teaching practices. In addition to giving guidelines to institutional practice, these two approaches to assessment are good exemplars for TAs or tutors: identify objectives and make sure that these objectives ultimately encourage student learning.

Engineering Writing and Professional Communications for ABET 2000: If we didn't have a Writing Center, we'd need to invent one

Charles W. Brice
ECE Department
University of South Carolina

Meeting ABET's criteria by the year 2000 is an imperative all engineering colleges face and therefore affects almost all their activities. Here, Dr. Brice explains that, in addition to being good for other reasons, the Writing Center in the Department of Electrical and Computer Engineering at USC helps meet ABET's demands.

Abstract

In preparing for the ABET Engineering Accreditation Criteria 2000, the Electrical and Computer Engineering Department at the University of South Carolina has set up a committee to ensure that we are ready for the drastic changes. As the chair of that committee, I believe our Writing Center has an important role to play in the plan for meeting the challenges ahead of us in Engineering Education. Indeed, it is my belief that if we did not already have a Writing Center, we would need to invent one to meet the requirements of ABET 2000. This paper is an informal discussion of how I envision the integration of engineering writing and professional communications within the whole engineering program, under the requirements of the new accreditation criteria.

Background of the ABET 2000 Committee

The members of the ABET 2000 Committee have quite varied backgrounds, including:

- Libby Alford (Writing Center)
- John Bowles (Computer Engineering)

- Charles Brice (Electrical Engineering)
- Roger Dougal (Electrical Engineering)
- Ed Ernst (Gateway Coalition)
- Jerry Hudgins (Electrical Engineering and Associate Department Chair)
- Theresa Masters (Administrative Assistant and Student Advisement)
- Robert Pettus (Computer Engineering and Department Chair)
- Tom Ward (Career Center)

We have tried to set up a team that has as many diverse points of view as possible. The recent experiences of our ECE Department have taught us that such a team composed of members of diverse backgrounds and experiences can be much stronger than one composed of all ECE faculty members. As long as everyone on the team is committed to working together, we all gain by the diversity of experiences and outlooks.

How the Writing Center Fits into the Puzzle

The ECE Writing Center has proved to be a very important resource to the ABET Committee in several respects, which are discussed below.

First, the Center personnel have experience in performing assessments and meeting individual needs of students. This direct experience is very valuable as we struggle to incorporate outcome assessments into the engineering education process. We will need to build on their experience, but having the experience of the Center as a pilot project on outcome assessment is a good beginning.

Second, the Center has been using the ideas of reflective practice and the use of writing to encourage students to be active learners. It is almost common knowledge that writing or giving an oral presentation about a subject is an excellent mechanism for learning. We intend to take advantage of the Writing Center's expertise to use writing as a means to learn in several areas of the curriculum. This process has already started, but will need some expansion. Along a similar line, the ideas of reflective practice are expected to be key parts of our plan to meet the ABET criteria. Here again, the Writing Center is already doing it; we simply intend to broaden context to the engineering curriculum.

Third, the Center has been quite helpful in providing ideas about student portfolios. We think that the concept of the student portfolio is a perfect medium for documenting the experiences of that student. Writing portfolios and artist's portfolios are quite common. Again, we are thinking of extending the idea to an Engineering Design Portfolio, which would contain selections of the student's work. This could include samples of the student's reflective writing, laboratory reports, design projects and software projects, for example. The use of portfolios will emphasize to the student that she must be an active participant in the learning process, not just a container of knowledge.

The Writing Center can also provide guidance and assistance to faculty members who may have limited experience with many of these ideas. This is expected to be a temporary problem, since many of these ideas are showing up in the engineering education literature. Panitz [*ASEE Prism*, March 1996, pp 24-29], for example, surveyed a number of colleges and universities that are using portfolios in various ways.

Finally, and perhaps most importantly, the Writing Center will assist us by continuing to fulfill its basic mission to provide assistance to students when they need to communicate. In the long run, enhancing the ability of the student to communicate is a top priority of the university, irrespective of accreditation requirements.

What Are the Other Pieces of the Puzzle?

Control over a subset of the curriculum

The first substantive issue facing the committee was how to maintain the needed curricular controls to ensure that the ABET criteria are met while maintaining academic freedom of the faculty. Our solution is to identify a subset of the curriculum consisting of a small number of required courses and including the laboratories, which were already the core of the undergraduate experience of the students. If the department can maintain strict control over content in these courses, then other courses are affected only to the extent that the course instructor is willing. Thus, we do not prevent anyone from participating in meeting the ABET requirements, but we require participation of only a subset of the faculty. We have had no problems recruiting volunteers to be part of this team. In fact, we think that eventually most of the faculty will willingly participate.

Software engineering models

Early in the process of exploring possible frameworks for this effort, we learned about a software engineering model, called the Capability Maturity Model. We are attempting to use this as the basic scheme for our work. Although this model is beyond the scope of the present discussion, it provides a guide for assessment of the maturity of software development processes. An important feature is that the model provides the necessary steps to move to the next level. The Capability Maturity Model looks to be easily transferred to the assessment processes required for the ABET criteria. For more information, point your web browser to the Software Engineering Institute's home page at Carnegie-Mellon University (www.sei.cmu.edu). We hope to use this model as a framework for our assessment process.

Quality function deployment

This methodology originated in industry, where it is used to make sure that a product includes those features that customers value most. In principle, much the same idea can be used to assess course content and student performance. The quality function deployment concept is very intriguing, and merits more study. It appears that it could allow a more quantitative approach to be taken. We realize that much of the data that is most useful is qualitative. In some cases, quantitative measures of this qualitative data may be available from the outcome assessment process.

Career planning and project management

Since there are clear needs for students to demonstrate capabilities in project management, and since career planning is obviously important to the long-term success of the student, we

have chosen to make career planning one of the focal points for our new requirements. With the assistance of the Career Center, we propose that our students be asked to research current employment trends and use this information to plan their career path. Project management will be incorporated into the process. In essence, we will tell the student, "Planning your own career is your first project management assignment." This career planning management will become a part of the advisement process.

Student advisement

At present, student advisement in our ECE Department is mostly oriented toward registration. Our plans are to make drastic changes that will move advisement into an ongoing process. We hope that the career management and the engineering portfolios that were mentioned previously will become important parts of the advisement process. In short, advisement will include student advisement, monitoring and tracking functions, and possibly outcomes assessment. The details of how this arrangement will work are not yet clear, but the overall concept appears to us to be workable.

Assessment of Where We Stand Today

The ABET 2000 Committee has been in general agreement about the directions that are discussed here. We will be developing our detailed action plans this summer, and substantive issues remain. In particular, we have not yet completed the design of the processes for outcome assessment or student advisement. The Writing Center will have an important role to play in the process of developing and implementing the plans. We think that the concept of the student as active learner, rather than passive container of knowledge, is important to the success of our endeavor. Without doubt, the software engineering concepts, the ideas of quality function deployment, and the incorporation of career planning are also important components of our plan. Student advisement continues to be essential. However, I believe that the active participation of the Writing Center will prove to be the key to producing the active learner that the ABET 2000 demands.

If we didn't have a Writing Center already, we'd need to invent one.

Assessment and TA Training

Tom Gasque Smith, Writing Consultant
ECE Writing Center
University of South Carolina

Smith describes how the assessment of student writing has informed his practice as a writing consultant. In the first section of his paper, he describes the recent evolution of the ECE Writing Center's assessment activities. He includes a number of samples of assessment materials. In the second part of his paper, he describes how the observational skills assessment requires helped him to analyze his work with students in two writing centers.

Part One: Assessment

When I first arrived at the ECE Writing Center a little more than a year ago, assessment was an activity writing center personnel engaged in, in which students were asked to produce a brief piece of writing at the beginning of their sophomore lab course, EECE 201. The following is the assignment students are given.

EECE 201 Writing Assessment
Summer 1997

Instructions:

This writing exercise asks you to compose a brief essay based on your previous semesters at USC or any other college. You will have an hour for the entire assignment, including prewriting, drafting, revising, and printing out the final version. You may start writing as soon as you have read the instructions, and you may leave after you have handed in a printout of your final draft. (We also want you to turn in any rough drafts, outlines, or prewriting.)

Be sure to type your name and student identification number at the top of your screen when you begin to write. Also make sure that your name and student identification number appear on your paper when you turn it in.

Writing Assignment:

Context: In order to plan effective writing consultation programs for your class, the staff of the ECE Writing Center wants to learn about your previous learning experiences in college.

This information tells us what types of learning experiences you value. In addition, your essay will enable us to develop programs that build upon your strengths as a writer and help you master successful strategies for writing as an engineer.

Assignment: Write a brief essay describing and analyzing one of your learning experiences in college. You could choose a particularly rewarding class, a challenging project, a successful paper assignment, or an important test in which you demonstrated mastery of a difficult subject. Or you could focus on a less successful situation from which you learned some valuable lesson. Whatever you choose, please describe the learning situation and explain what you learned from it. Then analyze what the experience taught you about your own learning process and what changes, if any, it produced in your attitudes or behavior.

Over the course of the semester, consultants would respond to the pieces of writing this assignment produced. Responses were based on rhetorical traits often described by writing teachers. The students' descriptions of a particularly memorable learning experience were analyzed in terms of purpose, audience, organization, etc. The responses were recorded according to the criteria below.

Writing Assessment

Rhetorical Feature	Comments
Audience	
Purpose/Content	
Arrangement	
Analysis/Reflection	
Style/Sentence Structure/Grammar	
Recommendations	
To writing center/instructor	
To department	
To student	

Once a week, consultants gathered to respond to and discuss four or five essays written by students. It taught us much about our students—they did not exhibit "grammatical" problems, for example. But I wonder if, most of all, these pieces of writing allied us with students. We asked them to tell us what works and what doesn't in teaching and learning, a gesture which I think showed them we cared about improving instructional techniques. Also, we made sure to respond to the content of these students' essays in writing, as a kind of opening welcome to the student. Below are two examples of students' responses to the assessment assignment.

Sample Student Responses

Student 1

Prior to entering college, like other students I believed my writing skills were top-notch. All that preparation from high school, the poetry contests, and the short stories were more than enough practice to prepare any high school student for their first college writing experience. As the time came closer for me to submit my freshmen English 101 portfolio, I believed honestly in my heart that I would have

exempted that course. Sorry to say, but I didn't. Inside my portfolio were the skills that I was known for, short stories and poems. However, I learned that my wonderful skills didn't appear to be so wonderful to everyone.

English 101 was a true learning experience and turning point in my writing career. There I learned that writing is like an expression of how you feel, think, and relate to certain topics. In my case, it appeared that I couldn't relate to well to anything. I faced problems with subject-verb agreement and with clarity of the content. Though these two areas were my only problems, they were major ones. These problems became so terrible that I was strongly urged to go to the writing center or face English 101 twice. Well, the choice was pretty easy to make. There, the writing center guided me and encouraged me in the right direction and from then on I slowly began improving in my writing.

When this experience first came upon me, it dampen all the hope that I had of becoming a low-level author. As I thought about, it only helped me in becoming a better writer that will be able to better express my thinking to people in a way that is clearer than before. Although, I still have poems and short stories that I would like to have published, I will always remember to incorporate those teachings into my writings. In my future author years, when the name XXXXX is heard, my English professor and others will remember that I worked hard through the struggle to get to that deserving point.

Student 2

A Good Learning Experience

One of my best learning experiences I have ever been through was while I was in the Marine Corps. I joined the Marine Corp in June, nineteen-ninety only twelve days after I graduated High School. I was sent off to Paris Island where I would undergo three months of vigorous training. I graduated Honor man in my platoon and left shortly after to start on my military occupational specialty school. I was sent to Twenty- nine Palms California where the Marine Corps School of Communication Electronics is located.

When I arrived at the school I had to adapt to the learning environment of the military. High school was a walk in the park compared to what I was about to endure. I was forced to get up at 0530 to report to physical training where I ran and did other various exercises. Then I had one hour to take a shower, shave, go to chow, and report to school by 0800. This environment was a little different than civilian schooling in many good was. For eight hours a day with a few ten-minute breaks and a lunch I sat in uniform with everybody else and learned electronics in the most simplified manner I had ever been taught. Handed to me was a detailed outline of the material I was going to learn that week that had the enabling learning objectives covered thoroughly. This is the same material the instructor used to teach the material to the class. I was given a quiz everyday and I was tested every week. If I did not make above an 80 for the week I was held back a week. If I was held back more than one week I was sent to some other school like paint removing or something of that nature. Luckily I never failed a week although there were a lot who did. I learned more in this school than I have ever learned in any environment that I have ever been in.

> The reason I feel I learned so much in this school was because of the mission of the school. The mission of the school was to get every one to pass the class and learn the material so we could have effective communications equipment in combat and keep men alive. It is very critical that a Marine knows his or her job well or men can die. I believe that also the pressure on the instructor has a lot to do with the learning of the students as well. I do understand that everyone has different learning capabilities but over all in this type of environment anyone can almost learn. If our public schools and Universities had the same attitude then military schools, concerned students would benefit much more than they do now. I am glad I was able to experience the military schools and now the colleges because I can now compare the two. So far my greatest learning experience has been in the military. I hope I can soon tell how great of a learning experience I had at the USC Engineering writing center.

Reflecting on the Process

What always seemed a bit problematic about this process to me, however, was that this assessment process remained somewhat distant from the classroom. Put simply, we were not "officially" these students' teachers, so how practical was our assessment? Another qualm I had about our activity was that, even as we went into great detail in explaining the rhetorical traits of students' writing, our communication with students rarely explicitly brought up the categories about which we were concerned. If students seemed not to have organized their assessment essay very well, we might respond by describing the texts they would produce in 201. Or we might simply remind the student that, in addition to the instruction their TA and Writing Center groups would provide, he or she could sign up for individual appointments with us. I am perhaps hyper-sensitive about forthright responding to writing, but I was simply concerned that we were gaining information about students that we weren't explicitly returning to them.

At the same time that I was having more and more difficulty using the worksheet of rhetorical traits, our informal talk about the ECE Writing Center focused more and more on our role as a student advocacy center and, therefore, the extent to which we helped in retention efforts. Not only that, Kris Walker was teaching all of us more and more about Genre Analysis. Her talk and writing about genre as a social construct led me to think about asking different questions about the essays we were reading.

Asking Different Questions About Writing

After considering our role as an advocacy center for students, we developed the following criteria to help us make inferences (based on texts) about students who participated in our assessment:

1) **Writer's positioning of self in relation to academia**

2) **Level of security writer feels within engineering environment**

3) **Writer's attitude toward communication skills**

4) **Writer's attitude toward group work**

5) **Level of preparedness for conventions of ECE writing**

6) **Advice from Writing Center staff**

These criteria were developed as a response to the idea that ECE is a community and its students are aspirants within that community. The criteria—with the possible exception of the fifth and sixth questions—that the first step to learning the discourse conventions of a community is feeling a part of it. Therefore, moving from broad to concrete, the questions encourage inferences on the part of the assessor about the student's relationship to academia in general, to the ECE department, and to the kind of team work common in engineering classrooms and laboratories.

I'm still troubled by the fifth question—after all, it seems quite difficult and overly speculative to infer students' preparedness for genre conventions of EECE 201 when we haven't asked for the kind of writing that class demands. Still, we attempted to make inferences. We include the final category—Advice from Writing Center Staff—because we are concerned with a basic tenet of writing assessment: it should inform teaching. What better way to ensure this than to ask for a response immediately following the assessment questions? The question forces the assessor to prioritize the comments included in the previous questions. Below are two sample responses that students received from a writing consultant. Instead of assessing textual qualities, they indicate a genuine interest in the students' writing as a communicative act.

Sample "Advice From Writing Center Staff"

Response One

What a great experience you've had. It sounds like it was tough at the time, of course, but things seem to be looking up for you.

We have an ECE Writing Center because we think that the experience you had in the Writing Center could be valuable to all students—not simply to be used as a threat. As a writer of poetry and short stories, you must appreciate the experience of seeing first-hand how a reader reacts to your writing. All writers need that kind of feedback that's hard for a teacher to convey in written comments. Discussing writing with classmates, with TAs, and with professors is the best way to improve the learning curve.

Another thing to consider: people often think that short stories and poetry are inconsistent with engineering. I don't agree. It seems to me that if you're comfortable writing a journal—including personal thoughts, poems, short stories, whatever—you could begin to explore the connections you see between your literary and scientific pursuits. You'll learn more about both, I bet. Also, the Engineering College, as you may know, sponsors a Poetry contest during Engineers Week. (I forget the precise time of year, but I think it's in the Fall.) You might just win $1000 with your poetry—and get it published.

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Response Two

It sounds like you've had really positive experiences with teamwork. That's great news. I know that, personally, had I been challenged to work in teams from the beginning of my undergraduate work, I would be more knowledgeable and open to different ideas than I am now. Only in graduate school have I learned the value of working on a team—a value which has been confirmed in work in the "real" world. Everyone, it seems, works in teams except the occasional old-fashioned lecture class.

The Writing Center at ECE is designed as another layer of the teamwork that is integral to the ECE curriculum. Perhaps the difference is that the team you work with in the Writing Center will be primarily interested in improving one another's communication skills. We will meet in groups each week to work on your next lab report and to analyze successes and problems from previous ones. Also, the groups allow a time—like lab—when students can tease out solutions to problems without always resorting to the "experts," your TA and Professor.

The problem that students and professors often experience is a disparity in language. A professor who has taught for 15 years is an experienced engineer who uses a language—spoken, written on the chalkboard, etc.—unfamiliar to students. Also, students can often explain the same concepts more effectively to their classmates because the way they talk is more familiar. By having Writing Center groups, we can learn better ways of communicating with students at the same time that students learn better ways of communicating with their professors.

At the same time that working in Writing Center groups is expected of students, it's not a graded component of the course. At this point in the curriculum, it's expected that you and your fellow students will make this time (30 to 45 minutes each week) useful for your particular needs—with some help from us. Because of our research, we've learned what parts of lab reports are problematic for many students. We've also learned better ways of communicating expectations for the course. I'm impressed by the thought you put into analyzing your past experiences and I hope you'll remind us all of your four points throughout the Summer. I look forward to a great group.

Relating Assessment to Training

Perhaps you've noted that the title of this presentation mentions assessment as related to TA Training. While our assessment program was never conceived of explicitly as training for TAs, it has had that effect. Consultants who are TAs are forced to engage in analysis of and response to texts. At the same time, this analysis takes place in a relatively "safe" atmosphere wherein they can be wrong without negatively impacting a student. Students don't necessarily see the kinds of things we write—indeed the final question is intended as a way to make explicit the concept that observations about student writing should ultimately result in communication with that student. In essence, it reminds, "be careful."

For a consultant, this is a way to begin prioritizing observations based on the question, "What observations are opportunities for teaching rather than simply descriptions of an authorless text?" Colleagues (and other authors in these Proceedings)—Libby, Kris, Deanna, Stephanie, Nancy, and Jennie—temper and hone my commenting through Interactional Inquiry. As a result, this assessment of students is simultaneously an assessment of my ability to respond

effectively to student writing—without the level of defensiveness I've often experienced among TAs whose "assessment" activities are confined to their own students and classrooms.

How Assessment Can Be Used As a Training Exercise

In January 1997, the Writing Center staff offered a training program for TAs in ECE and opened it to TAs from other departments within the college. The program received favorable response. The most favorable comments identified a practice paper-responding session in which groups of TAs commented individually on a piece of writing from an Engineering 101 class before discussing the rationale behind their comments. They asked for more of that kind of practice—noting particularly that they had never considered the possibility that positive comments to students can teach if they move beyond the word "good" to describing the "goodness" identified and suggesting repetition elsewhere in the paper.

These TAs were eager for more practice and discussion of commenting. They wanted to learn how to assess—not just in order to better evaluate writing, but to teach it. I certainly remember my initial experience responding to the writing of a class I was teaching by myself. I'm a bit ashamed to say that I often commented more to justify a grade than to develop a teaching/responding strategy.

But our assessment strategies took me a step further. As I grew comfortable listening to the content of student writing, I began to realize that I had never taken the opportunity to listen to my own writing about students. In every writing center I've worked in, I've sent progress reports identifying the main features of consultations with students. These reports—relatively brief summaries of writing center consultations sent to students' professors and read by the writing center director—were collected from each of three periods: the second semester I tutored at a Humanities-based writing center, the eighth semester at that same center, and the second semester of consulting in the ECE Writing Center. Therefore, I went about categorizing the comments I'd made to professors from the second semester I worked—five years ago—the last semester at our Humanities Writing Center, and the second semester of work at ECE's Center.

Part Two: Self-Assessment, a Model for TA Training

Having been a tutor at several writing centers before being hired by the ECE Writing Center, I analyzed progress reports I had written. Analyzing these samples reveals the importance of discipline-specific writing instruction and offers a model for one aspect of a training program for TAs asked to teach writing.

Procedure

In each of the three samples, I categorized every sentence in the progress reports. The categories emerged from the comments rather than being predetermined. I tabulated the number of appearances of each category of comment, and I collected those categories that appeared an above average number of times within the sample. In order to compare the samples, I then applied common broader categories to each sample. These broad categories are textual, pedagogical, and affective. The attached tables show frequent categories of

comment within each of these three broader ones. These tables also show the total number of comments (whether frequent or not) within each of the three broad categories.

Sample One: Second Semester, Humanities Writing Center

In Table One below, it is obvious that my vocabulary for writing about textual matters is more varied than for either pedagogical or affective ones.

Table One: Second Semester Humanities WC—Categories of Comment

Textual Descriptions		*# of instances*
Organization		7
Sentence Clarity		6
Paragraph Clarity		3
Transitions		4
Thesis		6
Parallelism		3
Pedagogical Descriptions		
Had student write		3
Reading Strategies		3
Invention Strategies		3
Affective Descriptions		
Independence		4
Positive General Evaluation of Progress		27
Student will return		7
Among all comments:	*Textual*	13
	Pedagogical	6
	Affective	13

In the midst of this variety of textual commenting, however, it is significant that grammar is not on the list of frequent categories. A possible explanation is that I was frequently told that the Writing Center "did not proofread." (Like many clients, I did not understand how my more experienced consultant-colleagues defined "proofread.") At the same time, I vividly recall dealing with grammatical issues in texts as a way of biding time until I came up with something else to say. "Sentence Clarity" may be a conscious or unconscious code word for grammar.

Pedagogical Descriptions, it seems to me, are most notable for their absence. What's most intriguing to me about the first sample is the enormous quantity of "Positive General Evaluations of Progress." These are comments like, "Sam brought in a good draft"; "Sam made a lot of progress"; etc. Maybe, reports of success would, in my inexperienced mind, reflect well on me. At the same time, I don't view myself as deceitful so much as wishful—and also unskilled at evaluating sessions. "Negative General Evaluations of Progress" didn't make the frequency list: only once did I report a negative session. Twenty seven-to-one is a

pretty good ratio; but a tad inaccurate, I imagine, even for the most experienced writing center consultant.

Sample Two: Eighth Semester, Humanities Writing Center

In Table Two, the overall balance in the broad categories suggests not only that my vocabulary had developed; it also suggests that my priorities had changed. Note the appearance of "grammar" as a frequent category under textual descriptions; but not too frequent.

Table Two: Eighth Semester, Humanities WC—Categories of Comment

Textual Descriptions		*# of instances*
Quotation Conventions		6
Organization		5
Grammar		3
Sentence Clarity		4
Documentation Conventions		5
Pedagogical Descriptions		
Abstraction Ladder		3
Invention Strategies		6
Reading Strategies		5
Outlining		4
Read aloud		3
Audience		5
Affective Descriptions		
Positive General Evaluation of Student Progress		4
Report of my positive evaluation to student		3
Among all comments:	*Textual*	14
	Pedagogical	13
	Affective	10

Also, my repertoire of pedagogical strategies and concepts has clearly diversified. Not only had I worked in the Writing Center for eight semesters, but I also had taught English 101 and 102 by this time. While frequent categories are still lacking under the affective classification, the reports are clearly not filled with the nebulous concept "good." I also think the final category on this table is interesting; it shows that I am almost as likely to tell an instructor that I praised the student as to praise the student to the instructor. This kind of meta-commentary indicates a greater consciousness of praise as a tutoring technique: indeed, almost qualifying in my mind as a pedagogical description.

Sample Three: Second Semester, ECE Writing Center

In Table 3, note the dramatic reduction in the number of categories at my disposal. Under textual descriptions, there is a marked difference from earlier samples in frequent categories.

Table Three: Second Semester, ECE Writing Center—Categories of Comment

Textual Descriptions		*# of instances*
Naming/defining sections of lab reports		**5**
Formatting (transition)		**5**
Pedagogical Descriptions		
Group processes		**3**
Abstraction Ladder		**6**
Affective Descriptions		
Encouraging student to seek professor guidance		**11**
Among all comments:	*Textual*	8
	Pedagogical	6
	Affective	3

Under pedagogical descriptions, the category "group processes" appears—a category non-existent in my Humanities Writing Center progress reports. My affective comments encourage students to seek out professors. Finally, the percentage of affective categories is down to below 20. In my first semester, this number is over 40%. In my final semester at the Humanities Writing Center, the same figure is almost 30%.

Analysis and Conclusions: Progress Reports in the ECE Environment

The difference in these numbers suggests the importance of several factors: first, I became a neophyte again when I moved to engineering. Dealing with texts unlike anything I had seen before—lab reports full of equations, unfamiliar concepts, and devices I'd never used—perhaps I opted to discuss only those things about which I was confident. Despite my lack of familiarity with the field, however, my experience as a tutor helped me avoid the first sample's self-confident posing. Instead, my ignorance manifests itself in what I hope is a more mature manner: in a curious reversal of Writing Center affairs, I refer students to their professors.

My status as a neophyte is only one factor at work here. The ethos of ECE is quite different from what I'd previously experienced. The department chair drops by to chat and compliment; the associate chair seeks advice about the department's writing assignments in bi-weekly meetings with TAs. And the Center is located on the same floor as the departmental offices. Not only that, teamwork, group presentations and lab partnerships are

the norm. And retention is a goal frequently cited by faculty. These factors contribute to my willingness to suggest students find their professors.

Finally, the initial descriptions of the nature of the email medium (whether that's its nature or not) affected my commenting. In that way, the paucity of categories is an indication not so much of what happens in hour-long consultations, but of what priorities make it to the report. The reduction in affective commenting, it seems to me, is a product of both my assessment of engineers' tolerance for such comments and my desire to follow the advice I had when hired: to keep the progress report "factual."

In any case, this research suggests the dramatic difference that discipline-specific writing centers can cause in consultants' conceptions and depictions of their work. If an experienced tutor devises almost entirely new ways of commenting when context changes, certainly here is additional evidence that writing is by no means monolithic—and writing instruction only in the English Department is therefore insufficient. As Jennie Ariail, then Director of the Humanities Writing Center, suggested to me, the effectiveness of my comments is a matter of comparing them to the mission of the institution I serve, not comparing them to each other. However, comparing them to each other does offer self-knowledge. On that note, I'd suggest that this methodology, while perhaps statistically amateurish, might help consultants—typically undergraduate or graduate TAs—improve their progress reports and their teaching.

Responding to Student Lab Reports: A Guide for Tutors

Jean Gallagher
Humanities and Social Sciences
Polytechnic University

Jean Gallagher offers a model for training tutors to respond effectively to engineering students' writing. The following is a guide for new and returning tutors. This guide will be most useful as an outline for a training program for these tutors. Questions that appear throughout the guide beg for discussion among tutors and their trainers.

Questions to Ask Yourself and the Student

1. Does each section of the report perform its particular job?
2. Is each sentence specific enough? Can the student provide answers to the questions "how?", "why?" and "like what?"
3. Is each sentence complete, with at least one subject and verb? Are the individual parts of compound sentences connected by appropriate punctuation marks? Does each sentence begin with a capital letter and end with a period?
4. Does the writer use verb tenses and pronouns consistently?
5. Do subjects and verbs "agree" with each other?
6. Are there unnecessary words or phrases that can be left out?

Does each section of the report perform its particular job?

Most lab reports will have these components:

- ❑ Abstract
- ❑ Introduction
- ❑ Experimental Work (Procedures)
- ❑ Discussion/Analysis/Conclusion

Abstracts

- ❑ What, briefly, were the goals/objectives of the lab assignment (What did you set out to do?)
- ❑ How did you obtain the data? (What kind of measurements or calculations did you make?)

- What were the results of the lab? (What did you discover?)

Writing Process Tip: Try writing the abstract LAST

Introductions
- What's the subject of the report?
- What's the purpose of the experiment?

Experimental Work/Procedure
- What did you do during the lab?
- What are all the measurements and calculations you completed for the lab?

Discussion/Analysis/Conclusions
- What are the results of the lab?
- What are your diagrams, tables and graphs, and what are your explanations of these?
- What is the significance of these results?

Samples From Student Reports

Below are selections from student lab reports for an EE 192 experiment: Experiment #6 (The RLC Circuit). They are tools for beginning discussion among TAs about appropriate and effective responses to student writing.

Overview of the Experiment

> In this experiment the transient and frequency response of a series RLC circuit will be examined. The RLC circuit will be enclosed in a "black box" with 2 input terminals and 2 output terminals and a switch. Depending on the position of the switch, the output terminals will provide access to either R, L, or C. The arrangement of the elements is different in each box. By performing a series of measurements, you will determine the values of the circuit elements and the arrangement of the elements within the box.

Sample **Abstracts** from 5 student lab reports

- The objective of this experiment is to examine the transient and frequency response of a series RLC circuit. We compared the result from the lab to the theoretical result.

- [No Abstract Section]

- In this experiment, we required to distinguish R, L, and C elements in the black box; we needed to examine the transient and frequency response of a series RLC Circuit.

- In this experiment, the frequency response of the RLC circuit elements were examined. This network was encased in a black box and labeled number 5. A switch on this box produced the circuit element voltages on the output terminals indicated on the box. These responses were compared to theoretical responses.

- The Most important aspect of this experiment is the RLC circuit. We will be looking at the frequency response of the different elements of the circuit.

Which of these abstracts is the best? Why? Which needs the most work? Why?

Sample **Introductions** from 5 student lab reports:

- The RLC series circuit has two parts: the natural response, which is obtained by setting the second order differential forcing function to zero; the forced response, which depends upon the nature of the forcing function. The equipment we used in the lab are 1 oscilloscope, 1signal generator, 1 component black box, and 1 DMM.

- I this experiment we examined the transient and frequency response of a series RLC circuit. The RLC circuit is enclosed in a "black box" with two input terminals and two output terminals and a switch. Depending on the position of the switch, the output terminals provided access to either R, L, or C. The arrangement of the elements is different in each box. We determined the values of the circuit elements and the arrangement of the elements inside the box by performing a series of measurements. [Notice any similarities between this paragraph and the Overview of the experiment provided in the lab manual?]

- In the experiment, we required a oscilloscope, a signal generator, a component black box, a DMM, a frequency counter and a BNC Tee. We used to analysis the RLC circuit behavior.

- When analyzing networks, it is necessary to be able to predict the output with reasonable accuracy. The source dictates the response, and therefore must be examined closely to help predict a correct network response. Since the network was predetermined to produce a certain response, we can check the validity of a theory that is involved with this experiment for the various values that are important to this particular experiment. The transient response was first examined, and then the frequency response was then examined to determine the response the network would produce due to various sources. This allows the formation of a general expression to find the output voltages or currents.

- We will observe mainly the forced response of the circuits. First we look at the response of each element with a square wave since it contains a lot of frequencies, and then we will look at the response of the circuit elements with a sine wave source. we will vary the frequency of this sine wave and observe the results.

  We know from the pre-lab that the capacitor is a low pass filter, inductor a high pass filter and the resistor a band pass filter. This means that the capacitor will let low frequencies through and attenuate high frequencies, the opposite is true about the

inductor and the resistor will let certain frequencies through, and attenuate the others here are some pictures.

Which of these introductions fulfills its goals in the best way? Why? Which needs the most work? Why?

Is each sentence specific enough? Can the student provide answers to the questions "how?", "why?" and "like what?"

This seems to be a particular problem in the "Conclusion/Discussion" section. The Lab Manual reminds students: "No conclusions may be drawn which are not substantiated by *specific references* to the results shown."

- We found that the second method was the best to use because it provided better results. When I graphed the different values of Phi obtained in the lab, I noticed that although the graph for the first method seemed more presentable, the values for the second graph were more precise.

Notice the adjectives: "better," "presentable," "precise." Does the student need to specify what he means? Can he or she say HOW or WHY one graph is "more presentable" and the other "more precise"?

- Though the theoretical plots seem to be smoother and has fewer flaws, the experimental graphs do not deviate that greatly. The breakpoints and slopes are very similar, as well as their shapes are similar as well. The various bumps and such in the experimental plots can be explained by way of measurement. It is not likely that these types of errors will always occur since ideal results cannot be produced by practical devices.

Again, notice the *kinds of words* the students is using:
- **Adjectives** like "smoother" and "similar"
- **Plural nouns** like "breakpoints," "slopes," "shapes," and "various bumps"
- **Adverbs** and **adverbial phrases** like "that greatly"

- The time differential method is easier and more convenient but is more prone to errors than the Lissajous pattern method. Though the Lissajous pattern method conforms to the theoretical plot better, the time differential method can show the sign of the phase angle, as well as being more convenient to apply.

Once more, notice the *kinds of words* being used:
- **Adjectives** like "easier," and "convenient"
- **Plural nouns** like "errors"

You may also want to look out for **indeterminate pronouns** (everything, anything, something) which usually lead a reader to ask: "like what?" or "what's an example of this?"

Tutor Action Tip: Underline or point out words which could use some explanation or expansion. Ask or write in the margin "how?" or "why?" or "like what?"

Is each sentence complete, with at least one subject and verb?

- Abstract: To let the students verify experimentally the basic properties of resistive circuits: KCL, KVL, Ohm's law, linearity and superposition, Thevein's theorem and Max power transfer. Also learn to use PSPICE.

Tutor Action Tip: Discuss components of a complete sentence. Ask students to rewrite sentence so that it has at least one subject and verb.

Are the individual parts of compound sentences being connected by appropriate punctuation marks? Does each sentence begin with a capital letter and end with a period?

- This means that the capacitor will let low frequencies through and attenuate high frequencies, the opposite is true about the inductor and the resistor will let certain frequencies through, and attenuate the others here are some pictures.

Tutor Action Tip: Discuss basic sentence-graphics with student. Ask student to observe the graphic marks he/she is using to revise the sentence using correct graphics.

Is the writer using verb tenses and pronouns consistently?

- First we **look** at the response of each element with a square wave since it contains a lot of frequencies, and then we **will look** at the response of the circuit elements with a sine wave source.

Tutor Action Tip: Ask student to underline verbs, identify verb tenses used in sentence, and revise sentence so that verb tenses are consistent. Remind student that the bulk of the report (here's what was done) will be in the past tense, while definitions will be written in present tense.

Do subjects and verbs "agree" with each other?

- Though the theoretical **plots seem** to be smoother and **has** fewer flaws. . .
- The phase **difference** between the voltages **are** examined using two methods. . .

Tutor Action Tip: Ask student to identify the subject and verb in sentences, to identify singular and plural subjects, and to revise sentence accordingly.

Are there unnecessary words or phrases that can be left out and/or rewritten?

- The breakpoints and slopes are very similar, as well as their shapes are similar as well.

Tutor Action Tip: Ask student to identify repeated words and to rewrite the sentence.

Professional Communications Assignments in Freshman Engineering Courses: A Panel

Kristin Walker, USC
Audeen Fentiman, OSU
John Peeples, USC and Kryotech
Elisabeth Alford, USC
Willie Bates, USC
Tom Smith, USC

Students in freshman engineering courses are encountering reading and writing in their field for the first time. Often, these students do not feel comfortable writing for their English courses, much less for engineering ones. Helping students acquire critical thinking, reading, and writing strategies has been a goal of engineering professors as they introduce freshman students to successful communications in their discipline.

Part of helping students communicate within engineering is designing assignments that elicit thoughtful responses and provide students with opportunities to practice both reading and writing. To discuss effective means of accomplishing these goals, a panel of six professors, faculty members, and graduate students presented ideas and strategies they had implemented in freshman engineering courses.

Audeen Fentiman from Ohio State University introduced the panel by detailing strategies for writing that she implemented in her experimental engineering course. In this course, the students spend the third quarter doing a team project in which they design, build, and test autonomous robots that must navigate a maze and perform a number of tasks. Students are also required to document their work. The documentation includes a design schedule, a progress report, a written report (an outline, two drafts, and a final report are required), a laboratory notebook, and an oral report with visual aids. The course syllabus contains intermediate milestones for both the robot construction and the documentation, thus helping students to organize, manage, and pace their work. Fentiman integrated multiple writing assignments into her course, a process that helped reinforce the technical content the students were learning.

John Peeples, an engineering faculty member at the University of South Carolina with close ties to industry, emphasized the importance of promoting effective communication strategies to help prepare his Engineering 101 students for workplace writing. When Peeples began working in industry, his first boss instructed him to write with accuracy, brevity, and clarity.

These principles helped Peeples learn what his business audience expected from his writing. Based on his experience teaching and working for industry, Peeples highlights communication strategies that involve critical reading, cyber communications, oral presentations, and teamwork. All of these strategies help prepare students for academic success within engineering, since USC's senior engineering design course requires oral presentations based on teamwork and technology. In addition, students gain awareness of communications concepts which can accompany them to future workplace environments.

Kristin Walker from the University of South Carolina's ECE Writing Center discussed a multi-layered assignment that she and ECE Writing Center director Elisabeth Alford presented to Peeples' Engineering 101 course. Walker gave the students an essay on thermal interface materials that provided some introductory information for a later project the students would be doing. The students read the essay, writing their observations on this technical article. Then, the students discussed their observations with their peers. Audience, organization, graphics, and format (including headings and bullet statements, for example) were some of the textual characteristics the students responded to.

Alford extended the assignment by asking the students to collaborate in teams and produce a brief oral presentation on a section of the article. Prior to this assignment, Alford had discussed effective characteristics of oral presentations, and she illustrated the use of PowerPoint slides and handouts. She invited the students to use their own visual aids as they presented. Then, after the presentations, the students discussed the experience, noting effective characteristics of their own presentations and areas to work on in future presentations. This one assignment presented by Walker and Alford introduced students to engineering reading, writing, and oral communication strategies.

Willie Bates, a former Engineering 102 instructor, discussed how he integrated writing into his AutoCad course by requiring students to write abstracts. Bates had learned about the Writing Center when he was an undergraduate, and he visited the Center during one of his upper-level lab courses. He thought the center was so valuable that he began requiring his students to attend. For the ENGR 102 course, the students wrote a report on a pipe vise base; the report was a series of dimensional drawings. To expose his students to writing, Bates asked his students to write an abstract for the report and then ask for feedback from Writing Center consultants. In addition to this assignment, Bates also required his students to interview AutoCad users from industry and write a short essay based on the interview. Students visiting the Writing Center for this assignment received comments on integrating quotations, organizing their thoughts, and concluding their papers, as well as other writing strategies. By exposing students to writing so early in their engineering coursework, Bates increased his students' awareness of the importance of effective engineering writing.

Tom Smith from the ECE Writing Center related his experience consulting with some of Bates's ENGR 102 students who visited the writing center to discuss their abstracts. A component students frequently leave out of abstracts is some form of lesson statement, a conclusion which aptly describes the purpose of the report abstracted. Also, students' abstracts often do not reflect the structure of the report that follows, so consultants ask the student to compare the structure of the summary and the report. Finally, consultants encourage students to think of the abstract in terms of a key word search of the document. Tom stated that he often asks the students, "What hits would you get if you did a key word

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search of a database that included your abstract?" This question often leads students toward revision and toward an appropriate level of detail. All of these writing strategies help the ENGR 102 students consider their audience's needs, a concept that students will continue to apply throughout their engineering coursework.

Epilogue: Future Collaboration

As the Workshop ended, participants spoke enthusiastically about the collaborative inquiry that had been started at the beginning of the two-day event. In the little time remaining, they expressed their hopes for continuing the conversations that had been started, for continuing the sense of community that had been established, and for broadening the group to include representatives from other colleges and coalitions.

The participants also agreed that individuals interested in professional communications centers in engineering and other technical disciplines need ready access to information on issues in this growing field. Paul Miller, English Department, The Ohio State University, has developed, with support from a Gateway grant, a Website for that purpose. The address is

http://www.cohums.ohio-state.edu/english/programs/writing_center/gateway/gateway.htm

We encourage you to check this Website for information and to submit materials to Paul Miller for inclusion.

We also encourage those who participated in the 1997 Workshop and other readers of the Proceedings to suggest ideas for future workshops. These suggestions can be sent to

ECE Writing Center Program
Department of Electrical and Computer Engineering
University of South Carolina
Columbia, SC 29208

Finally, to enable continuing dialogue and collaborative inquiry on topics of writing programs and professional communications centers and programs in engineering, we have included a list of workshop participants and their current e-mail addresses.

Participants

Workshop on Engineering Writing and Professional Communications Centers
June 23-25, 1997
University of South Carolina

Burlington County College
Dave Bryenton
Department of Engineering
Dbryento@bcc.edu

Clemson University
Bernadette Longo
Department of English
Blongo@clemson.edu

Midlands Technical College
Diane Carr
Department of English
Carrd@mtc.mid.tec.sc.us

Alan Grier
Mechanical Engineering Technologies
Griera@mtc.mid.tec.sc.us

New Jersey Institute of Technology
Rob Friedman
Humanities and Social Sciences
Friedman@admin.njit.edu

Deran Hanesian
Department of Chemical Engineering
Hanesian@admin.njit.edu

Ohio State University
Audeen Fentiman
Department of Engineering Graphics
Fentiman.1@osu.edu

Paul Miller
English Department
Miller.1458@osu.edu

Polytechnic University
Jean Gallagher
Humanities and Social Sciences
Jgalla@photon.poly.edu

Tufts University
Nadia Medina
Director, Academic Resources Center
Nmedina@emerald.tufts.edu

University of Florida
Charles Glagola
Department of Civil Engineering
Cglag@ce.ufl.edu

University of North Carolina - Charlotte
Deborah Bosley
Department of English
Dsbosley@email.uncc.edu

University of South Carolina - Columbia
Elisabeth M. Alford
Department of Electrical and Computer Engineering
Alford@engr.sc.edu

Jennie Ariail
Academic Center for Excellence (as of July 1997)
Medical University of South Carolina
Charleston, SC 29401
Arailjc@musc.edu

William Bates
Department of Electrical and Computer Engineering
Bates@engr.sc.edu

Kristen Bearden
Department of Electrical and Computer Engineering
Kristen@engr.sc.edu

Charles Brice
Department of Electrical and Computer Engineering
Brice@ece.sc.edu

Edward Ernst
Department of Electrical and Computer Engineering
Ernst@engr.sc.edu

Chris Fosen
Department of English

Randy Miller
Department of English
Rlmill8@vm.sc.edu

Stephanie Metts
Department of Electrical and Computer Engineering
Metts@engr.sc.edu

John Peeples
College of Engineering
Johnp@kryotech.com

Robert O. Pettus, Chair
Department of Electrical and Computer Engineering
Pettus@engr.sc.edu

Deanna Ramey
Department of Electrical and Computer Engineering
Ramey@engr.sc.edu

David Rocheleau
Department of Mechanical Engineering
Rocheleau-David@sc.edu

Craig Rogers, Dean
College of Engineering
Rogers@engr.sc.edu

Thomas G. Smith
Department of Electrical and Computer Engineering
Smithtg@engr.sc.edu

Martha Thomas
Department of English
Thomasm@darla.badm.sc.edu

Nancy Thompson
Department of English
Nancythompson@sc.edu

Kris Walker
Department of Electrical and Computer Engineering
Kwalker@engr.sc.edu

Tom Ward
Director of Instructional Services
College of Engineering
Tward@sc.edu

University of South Carolina - Lancaster
Terry Ward Tucker
Department of English
Mpatterson@infoave.net